UNIVERSITY OF ARIZONA
39001007199352

# BUTTERFLIES OF CALIFORNIA

*by*

*John Adams Comstock*

DEDICATED
to one who first aroused
my love of Nature,
and encouraged always
the pursuit of Truth
in the
Sunlit Places—
MY MOTHER

# Butterflies *of* California

## A POPULAR GUIDE TO A KNOWLEDGE OF THE BUTTERFLIES OF CALIFORNIA

embracing all of the 477 species and varieties at present recorded for the state.

*by*

## *John Adams Comstock*

Formerly Director The Southwest Museum
President, Southern California Academy of Sciences; Fellow Entomological Society of London; Fellow American Assoc. for the Advancement of Science; Honorary Curator of Lepidoptera, Los Angeles Museum; Honorary Curator of Entomology, Southwest Museum; President, Lorquin Natural History Club; Director, Los Angeles Branch, Science League of America, Etc.

*Illustrated*

with sixty-three full page color plates showing all of the species known to inhabit the state, and the majority of those occurring in the *Southwest*, together with half-tone and line illustrations depicting the life histories of

*Western Butterflies*

Published by the Author
Dr. John Adams Comstock
501 Edwards-Wildey Bldg.
6th and Grand
Los Angeles, California, U. S. A.
1927

COPYRIGHT 1927
BY JOHN ADAMS COMSTOCK

UNIVERSITY OF ARIZONA
595.78
C739
LIBRARY

Text Printed by
McBride Printing Co.
Los Angeles, Cal.

# LIST OF ILLUSTRATIONS

Page
Larva and Pupa of *Papilio philenor* .......... 18
Egg and Larva of *Papilio zelicaon* .......... 21
Egg and Larva of *Papilio rutulus* .......... 22
Larva and Pupa of *Papilio eurymedon* .......... 24
Egg of *Parnassius smintheus* .......... 26
Larva of *Parnassius smintheus* .......... 27
Egg of *Neophasia menapia* .......... 29
Larva and Pupa of *Pieris beckerii* .......... 30
Egg of *Pieris sisymbrii* .......... 30
Larva and Pupa of *Pieris sisymbrii* .......... 31
Larva and Pupa of *Pieris protodice* .......... 32
Pupa of *Pieris rapæ* .......... 35
Larva and Pupa of *Euchloe ausonides* .......... 38
Pupa of *Anthocharis lanceolata* .......... 39
Larva and Pupa of *Anthocharis australis* .......... 40
Pupa of *Anthocharis sara* .......... 43
Egg, Larva and Pupa of *Catopsilia sennæ* .......... 45
Pupa of *Catopsilia sennæ* .......... 46
Larva of *Zerene eurydice* .......... 47
Egg, Larva and Pupa of *Eurymus eurytheme* .......... 50
Egg, Larva and Pupa of *Eurymus harfordii* .......... 53
Egg, Larva and Pupa of *Eurema nicippe* .......... 56
Protective Coloration, Tree-toad and Moth.......... 57
Egg, Larva and Pupa of *Danaus menippe* .......... 59
Protective Coloration and Mimicry, Owl Butterfly, Leaf-Butterflies, Walking-stick Insect and Mimetic Butterflies.......... 62
Egg, Larva and Pupa of *Coenonympha california*.......... 66
Egg, Larva and Pupa of *Neominois ridingsii* .......... 69
Egg, Larva and Pupa of *Cercyonis œtus* .......... 75
Larva and Pupa of *Cercyonis œtus* .......... 76
Egg and Larva of *Oeneis nevadensis* .......... 77
Egg of *Dione vanillæ* .......... 78
Larva and Pupa of *Dione vanillæ* .......... 79
Egg and Pupa of *Argynnis montivaga* .......... 93
Pupa of *Euphydryas chalcedona* .......... 97
Egg and Pupa of *Euphydryas baroni* ..........101
Pupa of *Euphydryas sierra* ..........105
Pupa of *Melitæa neumoegeni* ..........107
Egg, Larva and Pupa of *Polygonia satyrus* ..........121
Pupa of *Aglais antiopa* ..........126
Swarm of Monarch Butterflies at Rest ..........130
Unnamed aberration of *Vanessa virginiensis* ..........132
Pupa of *Vanessa carye* ..........135
Bred Variations of *Junonia cœnia*, Plate E..........137
Bred Variations of *Junonia cœnia*, Plate F..........139
Pupa of *Basilarchia lorquini* ..........143
Pupa of *Heterochroa californica* ..........146

62212

Egg of *Libythea bachmanii* ....................147

Egg of *Apodemia virgulti* ....................148

Larva of *Apodemia virgulti* ....................150

Palm Canyon, Coachella Valley ....................152

Larva and Pupa of *Atlides halesus* ....................155

Egg, Larva and Pupa of *Strymon melinus* ....................158

Imago of *Strymon auretorum* ....................161

Larvæ of *Mitoura juniperaria, Phasiana curvata*, etc., on Sprig of Juniper..165

Egg, Larva and Pupa of *Mitoura juniperaria* ....................166

Egg of *Tharsalea nubila* ....................171

Egg of *Heodes helloides* ....................174

Larvæ of *Leptotes marina* ....................176

Pupa of *Leptotes marina* ....................177

Disparity in Size Between *Brephidium exilis* and *Morpho hecuba*..........178

Larva of *Brephidium exilis* ....................179

Egg, Larva and Pupa of *Brephidium exilis* ....................180

Egg of *Plebejus acmon* ....................188

Egg of *Philotes sonorensis* ....................195

Egg of *Phœdrotes piasus* ....................196

Larva of *Epargyreus tityrus* ....................203

Larva of *Goniurus proteus*, and Pupæ of *Epargyreus tityrus*, *Goniurus proteus* and *Calpodes ethlius* ....................205

Egg of *Urbanus occidentalis* ....................207

Larva and Pupa of *Urbanus occidentalis* ....................208

Egg of *Urbanus ericetorum* ....................209

Larva and Pupa of *Urbanus ericetorum* ....................210

Yucca in Bloom ....................229

Map of the Counties of California ....................244

Map of the Life Zones of California ....................245

Collecting Box ....................247

Setting Block ....................249

Pinning Box ....................250

Butterfly Mounts, Glass Covered ....................251

Envelopes for Butterflies ....................253

Wing Patterns of Butterflies, Showing Venation, etc....................256

Egg of *Oeneis ivallda* ....................259

Chrysalis of Monarch, Showing Process of Hatching.................... ..260

*Neophasia menapia*, and *nigracosta* ....................267

*Euphydryas anicia, melanodisca, rubrolimbata* and *nubigena* ....................270

*Melitæa pola, monache* and *nympha* ....................275

*Mitoura siva, juniperaria* and *loki* ....................289

# TABLE OF CONTENTS

Page

Preface ........................ 13

Introduction ..................... 15

The Swallowtails and Allies. Family *Papilionidæ* .......... 17

The Whites and Allies, Family *Pieridæ* ...................... 28

The Milkweed Butterflies. Family *Danaidæ* .................... 58

Protective Coloration and Mimicry 61

The Satyrs and Allies. Family *Satyridæ* ..................... 65

The Brush-footed Butterflies. Family *Nymphalidæ* ............... 78

The Fritillaries. Subfamily *Nymphalinæ* .................. 80

Butterfly Migration..............127

Selective Breeding of Butterflies..138

The Snout Butterflies. Family *Libytheidæ* ...................147

The Metal-marks. Family *Riodinidæ* ....................149

Page

The Blues and Allies. Family *Lycaenidæ* ....................153

The Hair-streaks. Subfamily *Theclinæ* .....................154

The Coppers. Subfamily *Chrysophaninæ* ...............170

The Blues. Subfamily *Lycaeninæ*.177

The Skippers. Superfamily *Hesperioidea* ..................202

The Yucca Borers. Family *Megathymidæ*..................228

Synonymic List of the Butterflies of California ..................230

The Counties of California, with Map .............................244

Life Zones of California, with Map .........................245

The Capture, Preparation and Preservation of Specimens .....246

The Gross Anatomy of Butterflies.257

Original Descriptions of Authors' Species .......................261

# PREFACE

The need of an illustrated work on the butterflies of California prepared in popular form, has long been felt by nature students and teachers throughout the state. The subject has always held wide popular interest, each community having its enthusiasts. Progress in the study has been hampered by dearth of literature of a non-technical type.

The present work is the result of over twenty-five years of study of the North American Rhopalocera and Grypocera. Its primary purpose is to arouse a wider interest in this fascinating branch of natural history. To that end it has seemed advisable to use common names for all species. This has necessitated the coining of many apellations, since a large number of our western species are known in the literature only by their technical names.

While the work is, strictly speaking, limited to California butterflies, it will be found of use in all the western and southwestern states, as a means of identifying all of the common species.

California is unusually favored as an environment for this study. Within its confines are found nearly two hundred and fifty distinct species of butterflies, leaving out of consideration the many interesting varieties, local races, and aberrations. The diversity of climate and altitude, ranging from the highest peak in the United States, Mt. Whitney, to the lowest recorded area in Death Valley, and from the humid coast forests to the desert wastes, makes for a wide range of variation in flora and fauna. One finds every extreme between the boreal conditions of the Alpine zone and the subtropic environment of our southern deserts. In consequence there have arisen many indigenous species and local forms with restricted ranges. The diversity of our cultivated flora has given a footing for many introduced species. In a word, California has compressed within its boundaries the elements of an entomological empire,—a veritable happy hunting ground for the butterfly enthusiast.

A book of this nature would be impossible but for the unselfish co-operation of the many leading authorities. These have volunteered advice and the loan of their specimens whenever required, with the usual self-abnegation of the scientist.

The author's thanks are particularly due to Drs. William Barnes and Foster H. Benjamin, who have given every possible assistance over a period of years, in the elucidation of the many problems incident to the work. Dr. J. H. McDunnough, Dr. Henry Skinner, Dr. A. W. Lindsey and the late Dr. Charles Oberthur have rendered valuable aid. Our co-workers in California have been especially helpful in giving or lending specimens for study or illustration. Mr. Jean Gunder has placed his large and valuable collection at our service, which has made possible the illustration of numerous types and uniques. Mr. J. E. Cottle has extended many courtesies, and Messrs. George Malcolm, E. A. Dodge, E. P. Van Duzee, George H. Field, and many others have responded generously to every request.

The color drawings of larvæ and pupæ, reproduced on Plate 63 were made by Mr. R. F. Sternitzky, of San Francisco, a talented artist and entomological enthusiast. The color plates were prepared by the Southern Engraving and Colortype Company, of Los Angeles, California. Messrs. Theodore and Ben Lemmon, of this organization, have given helpful co-operation at all times, in an effort to secure faithfulness of color rendering and accuracy of line. Equal care has been given to the color printing, which was done by The Chicago Color Printing Company, of Los Angeles.

# INTRODUCTION

This work is not intended as an exhaustive study of the suborders of insects known as the Rhopalocera and Grypocera, but rather as a concise guide to the knowledge of the butterflies of California, by means of which the nature-lover may identify all of the species occurring within the territory embraced.

It is assumed that, before the student has begun the use of this book, a general knowledge of zoology has been acquired, either through observation, school training, or the use of text books dealing with the subject of life forms and general classification.

No attempt has been made to consider the various anatomical factors which form the basis for the classification of these insects, such as venation, appendages, genitalia, et cetera, since these have been adequately presented in standard text books on the subject.

Chapters dealing with the capture, preparation, preservation and breeding of specimens are subsequently included as an aid to the collector.

The usual symbols have been used to designate sex; ♂ for male, and ♀ for female.

A check-list of all species occurring in the state will be found on pages 230 to 243, which serves also to record the various synonyms.

In supplemental chapters we have incorporated all of the technical matter dealing with the terms used to designate the various portions of the butterfly anatomy, together with a reprint of all published descriptions of the author's species. This will be of little interest to the amateur, but will prove of great convenience to the specialist, who often finds it a difficult task to search out these technical papers in the various journals in which they first appeared.

# BUTTERFLIES OF CALIFORNIA

THE great division of Insects known as the DIURNA, or Butterflies is a subdivision of the order LEPIDOPTERA, or scale-winged insects. As the name Diurna implies, they fly mostly in the daytime, but there are a few tropical species that are night flyers.

The Diurna fall into two natural subdivisions; the Rhopalocera, or true butterflies (Superfamily PAPILIONOIDEA), and the Grypocera or Skippers (Superfamily HESPERIOIDEA).

Both of these groups reach a remarkable complexity of development in the Americas. Not only is there a multiplicity of species, far in excess of any other continent, but also there is a richness of coloration unequaled elsewhere. The greater number of these species, and nearly all of the brilliant examples, are confined to the tropics. Thus the butterflies occurring north of Mexico, some 670 distinct species in all, are, for the most part, dull and inconspicuous by comparison.

The butterflies of California are arranged in the following ten families:

| | |
|---|---|
| 1. The Swallowtails and Allies | Papilionidae |
| 2. The Whites and Sulphurs | Pieridae |
| 3. The Milkweed Butterflies | Danaidae |
| 4. The Ringlets, Satyrs and Allies | Satyridae |
| 5. The Brush-footed Butterflies | Nymphalidae |
| 6. The Snout Butterflies | Libytheidae |
| 7. The Metal-marks | Riodinidae |
| 8. The Hair-streaks, Coppers and Blues | Lycaenidae |
| 9. The Skippers | Hesperiidae |
| 10. The Yucca Borers | Megathymidae |

While the list of distinct species numbers only 233, it must be borne in mind that many of these are represented by numerous geographic and dimorphic forms, seasonal varieties and aberrations. With these considered, giving the following totals:

| | |
|---|---|
| Forms, seasonal, geographic and dimorphic | 146 |
| Aberrations | 95 |
| Distinct species | 236 |

there results the sum of 477 insects, differing sufficiently to require separate consideration.

### Superfamily

## PAPILIONOIDEA

### Family Papilionidae

THIS family of butterflies is represented in the New World by a large number of species, the greater portion of which are tropical. The Swallowtails, comprising the first division of the family, contain our largest butterflies.

Of this group, 22 distinct species occur north of the Mexican boundary. In comparison with faunal regions of like character in the Old World, this is an unusual number. On the other hand, in the second division of the family, the Parnassians, quite the reverse is true. The great number of forms occurring in the Old World are in strong contrast to the few subordinate forms in the Americas.

The California members of this family belong to groups that are not particularly gaudy in coloration, the predominant tints being black and yellow, with smaller amounts of blue or red.

### THE SWALLOWTAILS. Genus PAPILIO L.

THE PIPE-VINE SWALLOWTAIL *(Papilio philenor* L.) is to be found in the northern part of the state, being particularly plentiful in the regions north of the San Francisco Bay. Infrequent captures of the typical form have been reported as far south as San Diego, but these occurrences probably were strays from introduced and transitory colonies, since there is no native *Aristolochia* south of the Tehachapi. Occasionally Dutchman's Pipe vines are cultivated in gardens, but they do not seem to be sufficiently numerous to give a permanent footing for this beautiful butterfly.

Ehrmann has described an aberration *(obsoleta)* in which the white spots on the upper side of wings are entirely absent. We have no record of west coast captures of this aberrant form.

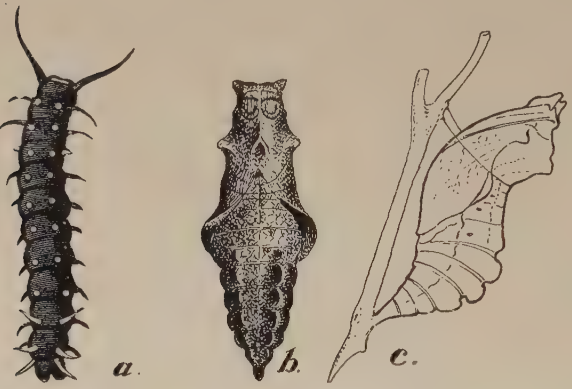


FIGURE A1

Caterpillar and Chrysalis of *Papilio philenor*

a. Dorsal View of Mature Caterpillar, (after Riley)

b. Dorsal View of Chrysalis. c. Lateral Outline of Chrysalis.

Early Stages. Egg. Spherical, the surface covered with a rough crust. Color of the egg surface, russet; of the crust, bright ferruginous.

Caterpillar and chrysalis. Described by Edwards in the "Canadian Entomologist," January, 1881, Vol. 13. See figure A1, and Plate 63, fig. 4.

Larval food-plant. Dutchman's Pipe, *(Aristolochia)*.

Illustrated. Plate 2. ♂ fig. 4; ♀ under side fig. 5.

THE HAIRY SWALLOWTAIL (*Papilio philenor hirsuta* Skin.) is a form of the above, distinguished by the hairy covering of the body and the relatively shorter tails. It is comparatively rare in collections.

Illustrated. Plate 2. ♂ fig. 6; ♀ under side fig. 7; ♀ fig. 8.

THE POLYDAMAS SWALLOWTAIL *(Papilio polydamas* L.) occurs abundantly in the countries below our southern border and in certain of our southern states. It is not an established resident of California. A freshly emerged specimen was captured in Santa Monica by Dr. Frank Clark in 1924. This may have flown ashore from a steamer which had previously touched at some Mexican port, or else been introduced as a chrysalis on imported nursery stock.

Early Stages. Egg. Undescribed.

Caterpillar. Resembles somewhat that of *P. philenor*, the color varying from brown-yellow to dark black-brown. The tubercles are long and, in dark specimens, red.

Chrysalis. Similar to *philenor;* strongly curved, with three long compressed humps on the abdomen, and a long thoracic horn.

Larval food-plant. Dutchman's Pipe, *(Aristolochia).*
ILLUSTRATED. Plate 1. ♀ fig. 4.

BAIRD'S SWALLOWTAIL *(Papilio bairdii* Edw.) represents a southern race of a polymorphic species which is rather widely distributed through the mountain states of the west, although it is not common in any portion of its range. The particular form bearing this name occurs throughout the Sierras, into our southern ranges, and on into Arizona. It has also been recorded from the Mojave Desert. It is closely related to the Common Eastern Swallowtail (which has heretofore gone under the name of *P. asterius*).*

There is considerable variation in the amount of yellow on the upper side of wings. Captures are on record for the months of July and August.

EARLY STAGES. Similar to those of the Common Eastern Swallowtail, as are probably also those of the three following subspecies.

Egg. Smooth and round, except for the flattened base on which it rests.

Caterpillar. Variable in pattern, the predominant color, when mature, green, with a black stripe across each segment on which is superimposed a series of yellow dots.

Chrysalis. Undescribed.

Larval food-plant. *Artemisia.*

ILLUSTRATED. Plate 3. ♂ fig. 1; ♀ fig. 2.

THE OREGON SWALLOWTAIL *(Papilio bairdii oregonia* Edw.) is a northern race of the above species which touches California only along the northern border, and the high desert plateaus of Modoc and adjacent counties. It may be distinguished from its near relatives by the greater amount of yellow on both upper and under sides of wing, and on the abdomen. Mid-summer to late summer finds it on the wing, but always in limited numbers.

ILLUSTRATED. Plate 1. ♂ fig. 5.

BRUCE'S SWALLOWTAIL *(Papilio bairdii brucei* Edw.) is another member of this inter-related group, intermediate between *oregonia* and *bairdii.* It has been recorded from Round Valley, south to Mono Lake, and from Mount Shasta, which leads to the conclusion that it may be found throughout the desert territory of the Mono Basin, and the plateaus to the north. It is exceedingly rare in our state, but occurs more commonly in Utah and Colorado. This form is close to *oregonia,* but may be distinguished by the fact that the yellow coloring is lesser in amount, there being practically no yellow scales in the basal area of the primaries. The abdomen also has less yellow on the sides.

---

*Now designated *ajax* L., the former *ajax* giving place to *marcellus* Cram.

In the regions where Bruce's Swallowtail and Baird's Swallowtail overlap it has been found that eggs of either species may produce both forms, as was demonstrated by W. H. Edwards. The above indicated territories in our state furnish just such a district.

ILLUSTRATED. Plate 1. ♂ fig. 6.

HOLLAND'S SWALLOWTAIL *(Papilio bairdii hollandii* Edw.) is the fourth member of this involved group. No records of its capture in California are available, but it will undoubtedly be found in the districts where the ranges of *brucei* and *bairdii* overlap. It is distinguished from *brucei* by the fact that the yellow of the hind wing does not completely fill the basal area, and there is a larger amount of the same color on the sides of the abdomen.

ILLUSTRATED. Plate 1. ♂ fig. 7.

THE ANISE SWALLOWTAIL *(Papilio zelicaon* Luc.) is our commonest swallowtail, with the possible exception of *P. rutulus.* It is most abundant in the lowlands, about townsites, where an introduced wild anise or fennel now furnishes its favorite food-plant.

The butterfly delights in sporting about the tops of bare hills, and it is frequently found on the highest mountain pinnacles, engaged in a game of tag with its fellows. There is no part of the state in which it may not be taken in season. The species seems to breed continuously throughout the year, except for a short period of winter cessation. Captures are recorded from February to November. The only other swallowtail with which it may be confused is *P. brucei.* The shorter more stubby wings of *zelicaon* may serve to distinguish it.

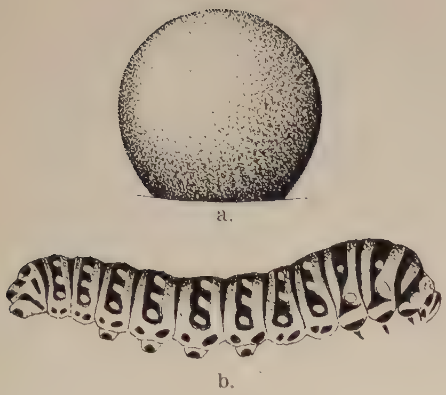


FIGURE A2

*Papilio zelicaon*

a. Egg, Much Enlarged
b. Caterpillar, Lateral View

Early Stages. Egg. Spherical, flattened at the base. The surface is smooth and the color a delicate yellow-green. This is described in greater detail by Karl Coolidge, in the "Bulletin of the Brooklyn Entomological Society," Vol. XIX, p. 44, and is illustrated in Figure A2a.

Caterpillar. In the early stages, predominantly black with orange spots. The mature larva is green, striped with black on each segment, and with a series of orange spots on the black bands. See Figure A2b.

Chrysalis. Adequately pictured on Plate 63, fig. 1. In the majority of examples the color is brown or gray-brown, but some are green.

Larval food-plants. The list of plants on which the caterpillar feeds covers a wide range, and includes caraway, *(Carum)*; fennel or anise, *(Foeniculum)*; rattlesnake weed, *(Daucus)*; *Eulophus* and probably many other genera of the *Umbellales*. In gardens it is occasionally found on carrots, turnips and parsnips, and in the southern orchards is sometimes taken on orange and lemon.

Illustrated. Plate 3. ♂ fig. 3; ♀ fig. 4; ♀ under side fig. 5.

THE SHORT-TAILED SWALLOWTAIL *(Papilio indra* Reak.) is one of our rare species, occurring in the higher altitudes of the central to northern Sierras and the northern coastal ranges. June and July are its favored months of flight. The illustrations will serve to differentiate it—the short tails serving as its particular characteristic. It is a difficult butterfly to capture, being rapid and erratic in flight.

Early Stages. Unknown, but probably resembling other members of the genus.

Illustrated. Plate 3. ♂ fig. 6; ♂ under side fig. 7; ♀ fig. 8.

EDWARDS' SWALLOWTAIL *(Papilio indra pergamus* Hy. Edw.) is the southern race of *indra,* and differs from it only in the longer tails and slightly narrower yellow band. The males somewhat resemble *P. bairdii,* but the longer and more pointed wings of the latter will serve to separate it.

*Pergamus* is confined to our southern mountain ranges, from the Santa Barbara Mountains to the Mexican line. It is an early species, most of the recorded captures being for April and May. Possibly it may have a second summer brood that has escaped the notice of local collectors. This species is another of our rarities, and like its northern cousin, is difficult to capture. Occasionally, however, it pauses in its mad flight to sip nectar from thistle blossoms, and it may then be netted more easily.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 2. ♂ fig. 1; ♀ fig. 3; ♂ under side fig. 2.

THE WESTERN TIGER SWALLOWTAIL *(Papilio rutulus* Luc.) is a familiar sight to the nature lover, as it occurs abundantly throughout the western states, and is on the wing from early spring to late fall. It flies at practically all altitudes, except in the alpine regions, and its lazy even flight and frequent feeding upon a variety of blossoms makes it easy of capture. *Rutulus* is a familiar sight in our city parks, and abounds in the foothill canyons, particularly along water courses.

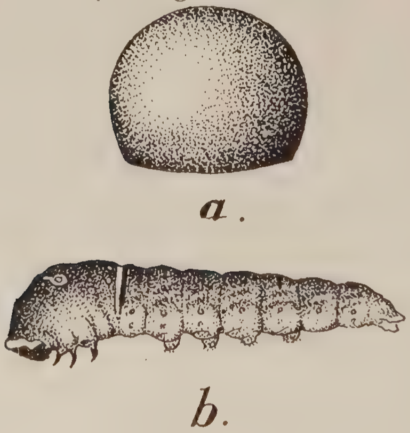


FIGURE A3
*Papilio rutulus*
a. EGG, MUCH ENLARGED
b. MATURE LARVA

EARLY STAGES. Egg. Sub-conoidal, flattened at the base, and of a smooth texture, as is the egg of the majority of our *Papilios.* The color is deep green. See fig. A3a.

Caterpillar. The mature examples are of a deep green, shading to lighter on the abdomen. On the fourth segment are two irregularly pyriform yellow spots, bordered with black, the larger ends pupillated with a blue spot. Back of the dorsum is a yellow line, edged posteriorly with black. The caterpillar draws together the edges of the leaf on which it rests with a silken network, which serves for concealment and protection. For this reason it is difficult to find.

Chrysalis. Dark brown, covered with irregular granulations. See Plate 63, fig. 2.

Larval food-plants. Willow, *(Salix* particularly *S. lasiolepis* and *lasiandra)*, Poplar, hop and alder.

Illustrated. Plate 4. ♂ fig. 6; ♀ fig. 8; ♂ under side fig. 7.

AMMON'S SWALLOWTAIL *(Papilio rutulus ammoni* Behrens) is a variety of the above, characterized by a darker yellow ground color, with the bands and marks of the upper side all rather broader and more distinct than in the typical form. It is exceedingly rare.

Illustrated. Plate 1, ♀ fig. 3.

THE DAUNUS SWALLOWTAIL has long stood in our lists as *Papilio daunus* Bdv. but in the latest publication by Drs. Barnes and Benjamin is designated *P. multicaudata* Kirby. The latter name is rather unfortunate, signifying as it does many tails, since this name would better fit another species *(P. pilumnus* Bdv.) which has three tails on each secondary. The TWO-TAILED SWALLOWTAIL might better describe the butterfly.

The species has been taken rather sparingly in California. Its range is in the central mountains, from the Santa Monicas through the Sierras to Shasta in the north, and in the Great Basin faunal zone, where it seems to prefer a semi-desert environment. It is evidently double-brooded, since records of capture are from May to August. It is our most regal *Papilio,* powerful in flight and disdainful of the approaches of the lepidopterist.

Early Stages. Egg. Undescribed.

Caterpillar. When mature, of an apple-green color, with a pale brown head. There are two spots of a lighter green edged with black on the fourth segment, and beyond these, on each side, are larger irregular spots of the same shade, with black edging. These enclose an apple-green spot edged with black, with a tiny blue pupil. Segment 5 bears four blue points, and is bordered posteriorly with yellow. Back of this, on the next segment is a broad velvety black band. Segments 8 to 11 each bear four dorsal blue points, and segment 13 has a transverse yellowish ridge. Laterally, beginning at segment 4, is a pale blue point below the yellowish stigma, and below this the ground color is mottled with grayish.

Chrysalis. Much as in *P. eurymedon,* but a little shorter and stouter proportionately. The color is dark greenish-drab, with the dorsal region shaded with black. The head is marked with a broad fawn-colored patch, and a streak of the same color occurs along each side of the abdomen.

Larval food-plants. Cherry, *(Cerasus)*; ash, *(Fraxinus)*; laurel, *(Umbellularia)*; willow, *(Salix)*; *Fragraria*, and probably several other genera.

Illustrated. Plate 4. ♂ fig. 1; ♂ under side fig. 2.

THE PALE SWALLOWTAIL *(Papilio eurymedon* Luc.) is abundant throughout the state, from early spring to September, with two or more broods to account for its long season. It is an occasional capture in the lowlands, but is more at home in the canyons and upland meadows of our mountain ranges, where one may often take it in great numbers as it sips the nectar of thistles or mints.

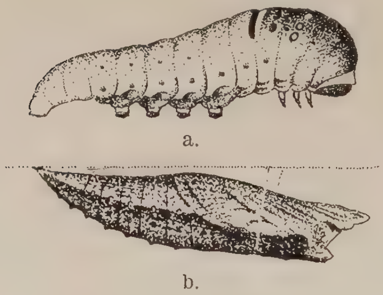


FIGURE A4
*Papilio eurymedon*
a. Mature Larva
b. Chrysalis, Slightly Enlarged

Early Stages. Egg. Nearly spherical, flattened at the base. The texture is smooth and slightly shiny, the color a yellowish-green, with a reddish shade on one side. Laid singly on the upper side of leaves.

Caterpillar. Head, purplish-brown, in the mature stage. The predominant body color is a uniform soft green. The illustration, Figure A4, serves to show the various markings, and a detailed description of all stages recorded by Dr. Dyar, will be found in the "Entomological News," Vol. 3, p. 243.

Chrysalis. Wood-brown in color, and similar in form to that of *P. rutulus*, and several others of the genus.

Larval food-plant. California coffee, *(Rhamnus californica)*.

Illustrated. Plate 4. ♂ fig. 3; ♀ fig. 4; ♂ under side fig. 5.

THE MOUNTAIN SWALLOWTAIL *(Papilio eurymedon albanus* F. & F.) is a high altitude form of the preceding species, characterized by its somewhat smaller size, more pointed primaries, narrower and straighter tails, lighter ground color and heavier bands of black. It is not a common insect in comparison with the typical form.

Illustrated. Plate 1. ♂ fig. 2.

## THE PARNASSIANS. Genus PARNASSIUS Latr.

THE CLODIUS PARNASSIAN *(Parnassius clodius* Men.) occurs sparingly in the coast ranges of California, from Santa Cruz north. It is rather local, only a few colonies being at present recorded. Undoubtedly diligent collecting will demonstrate a wider distribution. The members of this genus are characteristically alpine in habits, and it is, therefore, surprising to find this species at such low elevations in a territory so far to the south. June and July are its favored months of flight. One of the peculiarities of this group of butterflies is the pouch carried below the abdomen of the female after mating. This brittle appendage is formed during copulation, and, in *clodius* and its varieties, is large and white. By its presence one may distinguish virgin from fertile females. The figures on our plate do not represent the typical form, but are in reality closer to the race *claudianus* Stich., which is found in the alpine regions of Oregon. The coastal race is lighter, there being less of the heavy black border on the primaries, and practically no fluted submarginal line on secondaries. *Clodius* and its races may be distinguished from *smintheus* by the greater translucency of the margins of primaries, and also by the absence of red spots on the fore-wings.

EARLY STAGES. Egg. Nearly plano-convex, the top being arched, the base flat; edge about base rounded; depressed about micropyle. The color is a dilute coffee-brown. The upper surface is covered by a crust, which is pitted with little round cells.

Caterpillar. Probably similar to *smintheus,* which is hereafter described.

Chrysalis. Undescribed, but probably resembling that of *smintheus.*

Larval food-plants. Stonecrop *(Sedum),* and Saxifrage. Wright also lists violet and dewberry, *(Vaccinium).*

ILLUSTRATED. Plate 5, ♂ fig. 1; ♀ fig. 2.

DYAR'S PARNASSIAN *(Parnassius clodius altaurus* Dyar) is an aberration of the above species, in which the dark markings are somewhat reduced, and the usual red spots are of an orange or yellow color. The types were taken at Alturas Lake, Idaho.

ILLUSTRATED. Plate 5. ♂ fig. 6.

THE BALDUR PARNASSIAN *(Parnassius clodius baldur* Edw.) is a sierran race of *clodius* distinguished by its smaller size, somewhat reduced red spots in the male and the presence of an elongate red spot near anal angle in the female.

*Baldur* is commonly encountered in our upland meadows of the Sierra Nevadas, or sporting about precipitous cliffs, where it is by no means easy of capture. Fortunately for the collector, the butterflies frequently stop to feed upon the blossom-nectar of *Eriogonum* and other flowers, where they may be netted without difficulty. July and August are *baldur's* favored months of flight. The species ranges from the alpine regions of Tulare County north to the Oregon border.

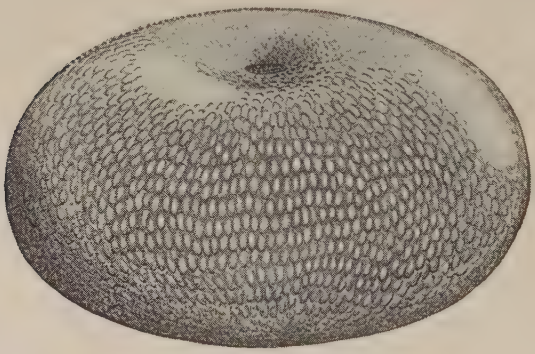


FIGURE A5
Egg of *Parnassius smintheus,*
Greatly Magnified

Early Stages. The egg was described by Mead in Psyche, Vol. 2, p. 181. Of the other stages nothing is known.

Illustrated. Plate 5. ♂ fig. 4; ♀ fig. 5.

LORQUIN'S PARNASSIAN *(Parnassius clodius lorquini* Oberth.) is an aberrant form of the male, in which the red spots are entirely absent, and the black markings reduced almost to obsolescence. So far only the type specimen is known. The figure is taken from Dr. Oberthur's plate, and represents both surfaces of the butterfly, the left half of the drawing depicting the under surface.

Illustrated. Plate 5. ♂ fig. 3.

Mr. Jean Gunder has recently described another aberration of *clodius,* which he has called *binigrimaculella.* This is illustrated in the "Entomological News" of January, 1926, Vol. 37. It has the normal primaries of the form *baldur,* but the secondaries have the spots greatly reduced and without a trace of red, the extradiscal one being a mere point.

THE LARGE PARNASSIAN *(Parnassius smintheus magnus* Wright) is a large northern race of *smintheus,* which may come within the territory covered by this work along our northern border. Typical *smintheus* is a Rocky Mountain species, and hence is excluded from consideration. *Magnus* closely resembles a Colorado race, *P. smintheus hermodur,* which is shown on Plate 6, figures 5 and 6, for purposes of comparison. It will be noted that *Magnus* is a larger form, with increased and heavier dark markings, and a more clearly defined submarginal line on primaries.

All of the races of *smintheus* may be separated from those of *clodius* by the fact that red spots occur on the forewings of the former, and the black mark in the center of cell of primaries is oval instead of being a band extending entirely across the cell.

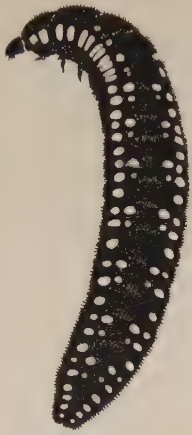


FIGURE A6
Larva of *Parnassius smintheus,* enlarged
(Redrawn from Edwards)

*Magnus* is on the wing only in mid-summer, and is a rarity.

Early Stages. Undescribed.

Illustrated. Plate 6. ♂ fig. 7; ♀ fig. 8.

BEHR'S PARNASSIAN *(Parnassius smintheus behrii* Edw.) is the race of *smintheus* occurring in the Sierras at high elevations, and characterized by its smaller size, clear-cut and somewhat reduced black markings, and orange or yellow spots in the place of red. It is relatively rare as compared with *P. baldur.* July and August are its favored months.

Early Stages. The egg was described by T. L. Mead in Psyche, Vol. 2, p. 181. Of the other stages, nothing is known.

Larval food-plant. *Sedum.*

Illustrated. Plate 6. ♂ fig. 1; ♀ fig. 3; ♂ under side fig. 2.

WRIGHT'S ABERRANT PARNASSIAN *(Parnassius smintheus* ab. *niger* Wright) is an aberration of the above in which the black markings are reduced in area, and the two spots of secondaries so constricted as to be merely black dots, without a trace of red. It is a rarity. Illustrated. Plate 6. ♂ fig. 4.

## Family Pieridae

# THE WHITES AND ALLIES

THIS family is composed of medium sized butterflies, in which the prevailing colors are orange, yellow, or white, with black markings superimposed. They reach their greatest development in the Palearctic region.

California is unusually rich in species, on account of the fact that it furnishes a suitable environment for both subtropical and boreal forms.

It is in this group that most of the species occur which are destructive to garden produce.

All members of the family are moderately good flyers—some species, such as certain Catopsilias, being remarkably agile. They are sun-loving butterflies, in spite of the fact that a few of the genera extend far into the arctic, and antarctic regions.

### Genus NEOPHASIA Behr

THE PINE-WHITE *(Neophasia menapia* F. & F.) is found in the pine belt throughout the sierran zone, and as far south as the Tehachapis. In favored seasons it occurs in abundance, occasionally causing serious damage to coniferous forests on account of the defoliation of the trees. One must look for it during the month of August, though occasional captures are recorded for July, and belated specimens may be seen in September.

*Menapia* is an aggravating butterfly to hunt, as it spends most of its time circling about the higher branches of the pines, only occasionally deigning to descend for a hasty sip of nectar from the scant blossoms of the forest floor. It may be tricked, however, into coming within range of a net by pinning a dead specimen of the butterfly on the tip of a low branch within easy reach, in as conspicuous a position as possible. A white piece of paper will serve the purpose, if the collector is quick to take advantage of the momentary visit of the butterfly. Only the males may be lured in this manner. The females are shy creatures, always rare and seldom on the wing.

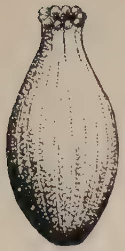


FIGURE A7
Egg of *Neophasia menapia*
Highly Magnified

Early Stages. The egg is flask-shaped, and fluted on the sides, with a circlet of porcelain-white bead-like knobs at the upper end, as shown in Figure A7. Color, emerald green. These are laid in rows at the base of pine needles.

Caterpillar. When mature, cylindrical, terminating in two short anal tails. Color, dark green, with a broad white band on each side, and a similar narrow stripe on the back. The true legs are darker in color, and the prolegs yellowish. The larva lets itself down by a silken thread and pupates at the base of the trees.

Chrysalis. Dark green, striped with white. In form it somewhat resembles the pupa of the Sulphurs *(Eurymus)* but is more slender.

Larval food-plants. Various species of conifers, among which the following have been specifically noted: *Pinus ponderosa, P. contorta, Abies balsamii.*

Illustrated. Plate 7. ♂ fig. 1; ♀ fig. 3; ♂ under side fig. 2.

THE BLACK-RIBBED PINE WHITE *(Neophasia menapia nigracosta* Comst.) is an aberrant form in which a heavy suffusion of black extends along the costa and into a portion of the cell. It is a rarity.

Illustrated. Plate 7. ♂ fig. 4; ♂ under side fig. 7.

### Genus PIERIS Schrank

### (ASCIA Scop.)

BECKER'S WHITE *(Pieris beckerii* Edw.) is confined mainly to the desert side of the Sierras throughout all of the eastern counties of the state. It may also be found in the higher mountain passes, and occasionally it wanders down the canyons which open on the coastal plains. In favored seasons it may be seen in large numbers on the desert plateaus or in the semi-desert foothills. It is probably single brooded at high elevations, but undoubtedly has two or more broods throughout the greater part of its range. Records of capture extend from March through to August.

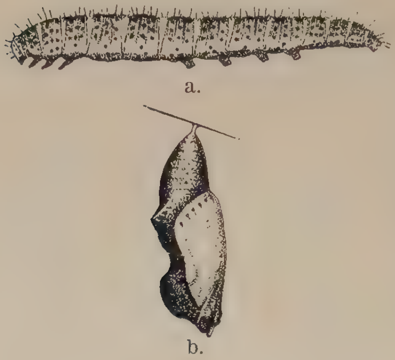


FIGURE A8
*Pieris beckerii.*

a. Mature Larva Slightly Enlarged.
b. Pupa, Side View, Redrawn from Edwards. (This is shown in the suspended position, but the normal manner of spinning in this genus is with a supporting girdle around the thorax.)

Early Stages. Egg. Undescribed.

Caterpillar. When mature, greenish-white, thickly marbled or sprinkled with gray, and with a distinct orange belt between the segments. Each segment also has sixteen or eighteen jet black tubercles, which taper into black bristles. The head is tinged with yellow. See Figure A8a.

Chrysalis. Much as in *P. protodice*, but less angulated. The front is terminated by a blunt point. Head, dark grayish-brown; remainder gray, except the wing cases which are nearly white. A pale stigmatal streak extends from the margin of the wing cases to the tail. A few black dots occur along boundary of thorax and abdomen. Figure A8b illustrates this phase.

Larval food-plants. Bladder pod, *Isomeris arborea* and other *Cruciferae.*

Illustrated. Plate 7. ♂ fig. 8; ♀ fig. 10; ♂ under side fig. 5.

THE CALIFORNIA WHITE *(Pieris sisymbrii* Bdv.) is not of common occurrence in its home state, although it is occasionally met in fair numbers through the central highlands. It is distinctly a mountain butterfly, never venturing onto the coastal plains. The species ranges throughout California at suitable elevations, but in the southern limits of its territory is something of a rarity. *Sisymbrii* is probably double brooded, as captures are recorded for the spring months of March and April, and also from June to August.

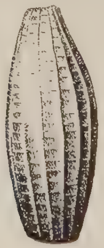


FIGURE A9
Egg of *Pieris sisymbrii*, Greatly Magnified

Early Stages. Egg. Conical, long and narrow, with a flattened base, and depressed top. It is longitudinally ribbed, with minute striae crossing the intervening depressions, and is illustrated in

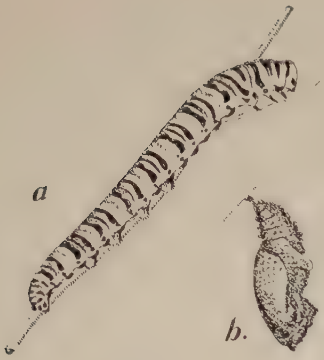


FIGURE A10
EARLY STAGES OF
*Pieris sisymbrii*
(AFTER EDWARDS)
a. LARVA, ENLARGED
b. PUPA

Figure A9. Color, at first yellow, but changing to a reddish hue shortly before emergence.

Caterpillar. Described in detail in Edwards' second volume. The mature larva is light yellow, crossed with stripes of black.

Chrysalis. Color, dark-brown; the entire surface covered with minute granulations except on the wing cases. For this and the previous stage, see Figure A10.

Larval food-plants. Species of *Cruciferae.*

ILLUSTRATED. Plate 7. ♂ fig. 13; ♀ fig. 11; ♂ under side fig. 12.

THE FLAVID WHITE *(Pieris sisymbrii ♀ flava* Edw.) (syn. *flavitincta.)* is a dimorphic form of the female of the above species, in which the ground color of both the upper and under side of wings is yellow. It is rare in collections.

ILLUSTRATED. Plate 7. ♀ fig. 9.

A recently described form of *sisymbrii* designated *elivata* by Barnes and Benjamin, may occur at high elevations in eastern California. It is characterized by heavier black powdering along the veins on the under side of the secondaries, and a slight reduction in size.

THE COMMON WHITE *(Pieris protodice* Bdv. & Lec.) is our most abundant *Pierid,* with the possible exception of *rapæ.* It occurs in every state of the Union, and is found in every faunal zone of California. Records of capture run from February to November, which would indicate a succession of broods. The early spring examples are of a different form, subsequently dealt with.

*Protodice* is subject to wide variation in size, as is the case with many butterflies. Dwarfs are not uncommon, and two of such examples are shown on Plate 8.

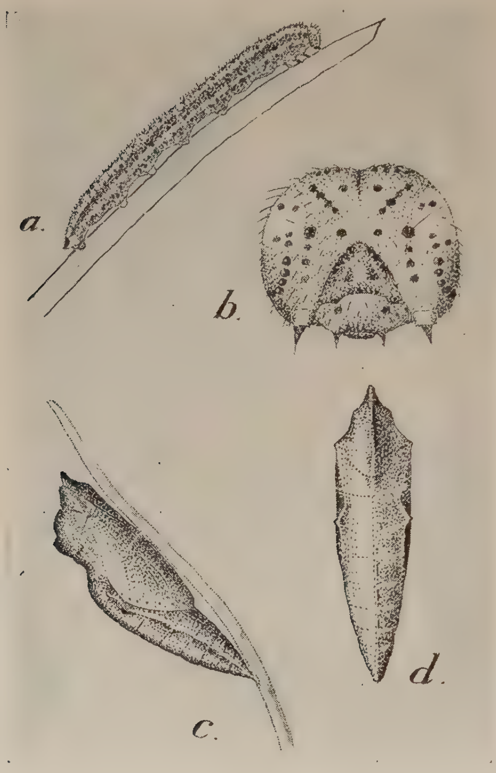


FIGURE A11
Early Stages of *Pieris protodice*
a. Mature Larva, Enlarged
b. Head of Larva, Greatly Magnified
c. Pupa, Side View, Enlarged. d. Pupa, Dorsal View, Enlarged

Early Stages. Egg. Spindle-shaped, with longitudinal low ridges, as in most of the Pierids.

Caterpillar. Variable in color from deep to pale bluish and green; it has four longitudinal stripes of yellow, and is thickly covered with black dots.

Chrysalis. Light bluish-gray, more or less profusely speckled with black, with the projecting portions tinted with pale yellow or flesh-color, and marked with large black dots. Figure A11 illustrates the larval and pupal stages, and Plate 63, fig. 12, shows the chrysalis in colors.

Larval food-plants. *Cruciferæ*, especially the mustards. It is destructive to cabbage, but is of less importance, economically, than *rapæ*.

Illustrated. Plate 7. ♂ fig. 14; ♀ fig. 17; ♂ under side fig. 15; ♀ under side fig. 16.

THE VERNAL WHITE *(Pieris protodice vernalis* Edw.) is the spring generation of the Common White, resulting from overwintering chrysalids. It is distinguished by its smaller size and darker, more distinct veining on the under side of secondaries.

Illustrated. Plate 8. ♂ fig. 2; ♀ fig. 3; ♂ under side fig. 6.

THE WESTERN WHITE *(Pieris protodice occidentalis* Reak.) represents a western high altitude race of *protodice* which is occasionally found in our mountains and northern counties. It is differentiated from the typical insect principally by the heavier veining of the under side, which is always of a greenish shade.

Illustrated. Plate 8. ♂ fig. 5; ♀ fig. 7; ♂ under side fig. 10.

EDWARDS' WHITE *(Pieris protodice occidentalis* form *calyce* Edw.) is the early spring brood of *occidentalis*, resulting from overwintering chrysalids, or prolonged low temperatures. It is smaller and darker than typical *occidentalis*, and is relatively uncommon. One is more apt to find it at very high altitudes, where the thermal influences necessary to its production are operative.

Illustrated. Plate 8. ♂ fig. 11; ♀ fig. 8; ♂ under side fig. 9.

THE MUSTARD WHITE *(Pieris napi* Linn.) is a highly polymorphic species, no less than eighteen different forms, races and aberrations having been described for America, north of the Mexican line. Typical *napi* does not occur in California, but the six forms hereinafter treated are taken within our confines.

Early Stages. These are probably very similar for all of the varieties, and will be recorded here for the entire group.

Egg. Pear-shaped, with longitudinal ribs. Color, yellow-green.

Caterpillar. When mature, pale green, with numerous darker dots, and a dark line along the back.

Chrysalis. Pale green or whitish, finely and regularly speckled with black, and in shape much resembling that of *P. rapæ*.

Larval food-plants. Turnip, cabbage, mustard, toothwort, crinkleroot, and a great variety of cruciferous plants.

THE PALLID WHITE *(Pieris napi pallida* Scud.) is a race occurring in the northern coastal regions, distinguished by its nearly immaculate superior wing surfaces in the male. The female shows a slight powdering of the veins in the apical area and usually a round spot below the third median vein, with a bar along the inner margin of primary. The under surfaces in both sexes show a slight darkening along the veins in the basal and discal areas. *Pallida* may be taken in the late spring and early summer. A yellow aberration of this form was named *flava* by Edwards.

Illustrated. Plate 8. ♂ fig. 15; ♀ under side fig. 17; ♂ under side fig. 16.

THE MARGINED WHITE *(Pieris napi marginalis* Scud.) is a large northern form occurring on the Oregon border, that shows a narrow distinct veining on the under surfaces and a fine narrow, almost indistinguishable, marginal border on the upper side, completely encircling the wings. The basal area on upper surface is more heavily powdered than in the preceding form. It is an early spring butterfly, and is rare.

ILLUSTRATED. Plate 9. ♂ fig. 2; ♂ under side fig. 1.

THE VEINED WHITE *(Pieris napi venosa* Scud.) is the most boldly and clearly marked of our California races of *napi.* It occurs from the central part of the state northward at low elevations, and is never abundant. It flies in the early spring, and represents a generation that has overwintered in the chrysalis.

ILLUSTRATED, Plate 9. ♂ fig. 4; ♀ fig. 3; ♂ under side fig. 5. (Labels for figures 3 and 5 were unfortunately transposed.)

THE SMALL VEINED WHITE *(Pieris napi microstriata* Comst.) is a dwarf race of *napi* closely related to *venosa,* which occurs in a limited district north of San Francisco Bay. It has more yellow on the under side of secondaries than other races of this variable species, and the dark markings are more restricted than in *venosa.* Like all of the heavily marked races, it occurs in the early spring. Barnes and Benjamin consider it synonymous with *venosa.*

ILLUSTRATED. Plate 8. ♂ fig. 12; ♀ fig. 14; ♂ under side fig. 13.

REAKIRT'S WHITE *(Pieris napi castoria* Reak.) is a large, lightly marked form representing the second brood of the Veined White, which emerges in the late spring and early summer. The immaculate under surfaces, and, in the male, the discrete points on the upper side of primaries, will serve to distinguish this race. It occurs in the same territory as *venosa.*

ILLUSTRATED. Plate 9. ♂ fig. 6; ♀ fig. 8; ♀ under side fig. 7.

HARRIS' WHITE *(Pieris napi oleracea* Harris) is a rare, high altitude race that is occasionally encountered in the central Sierras. Lightly marked specimens are difficult to separate from *pallida,* but the typical examples are more heavily shaded along the veins on the under side of secondaries, and are lightly penciled in the same area of the upper surface. The female particularly is heavily shaded above, along the nervules, and has a heavy band on the posterior border of the primaries. It is on the wing in early summer.

Illustrated. Plate 9. ♂ fig. 9; ♀ fig. 12; ♂ under side fig. 10.

THE CABBAGE BUTTERFLY *(Pieris rapæ* L.) is one of the serious insect pests of North America. It feeds upon members of the cabbage family, with a resultant loss of millions of dollars to truck gardeners. Like many other pests, it is polygoneutic, or in other words, produces many generations in a season. The mild climate of California allows it to propagate throughout practically the entire year.

*Rapæ* is not a native of the Americas, but like the English sparrow, is an undesirable emigrant from the old world. It was first reported in Quebec about 1859, and rapidly spread over the entire continent.

The name *rapæ* refers more particularly to the lightly marked spring brood, while the later generations with heavier markings should be designated *Pieris rapæ yreka* Reak.

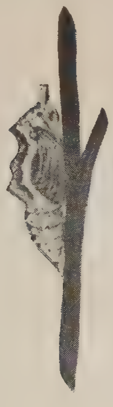


FIGURE A12
Pupa of *Pieris rapæ,*
Slightly Enlarged

Early Stages. Egg. Pear shaped; longitudinally ribbed with fine transverse striations. Color, yellow.

Caterpillar. Pale green, finely dotted with black, with a yellowish stripe down the back, and a row of yellow spots along each side. It has the unfortunate habit of eating its way into the heart of the cabbage.

Chrysalis. Variable in color, frequently assuming the shade of its surroundings. The predominant tint is pale green, speckled with minute black dots. See Figure A12.

Larval food-plants. A great variety of cruciferous plants, both wild and cultivated.

Illustrated. Plate 9. ♂ fig. 13; ♀ fig. 15; ♂ under side fig. 11.

THE TINTED CABBAGE WHITE *(Pieris rapæ novangliæ* Scud.) is a form of the male in which the upper surface is covered with a suffusion of canary yellow. It has not, thus far, been recorded for California, but the boreal environment of our uplands may not unlikely produce it in time, and it is therefore included.

Illustrated. Plate 9. ♂ fig. 14.

## THE DWARF YELLOWS. Genus NATHALIS Bdv.

THE DWARF YELLOW *(Nathalis iole* Bdv.) occurs in the southern portion of the state, and has been reported sparingly as far north as Inyo County. It is a lowland and foothill species, with a tendency to confine itself to restricted localities, and to be erratic and irregular in appearance. The period of flight is from February to September, with probably two or more broods to account for its long season.

Early Stages. Egg. Undescribed.

Caterpillar. Body covered with stiff hairs. Color, dark green, with a broad purple stripe down the back, and a double stripe of yellow and black along the side. The segment next to the head has a pair of cone-shaped bristly tubercles, reddish in color, projecting forward.

Chrysalis. No record of this is available.

Larval food-plants. Fetid marigold, sneezeweed, filaree, etc.

Illustrated. Plate 10. ♂ fig. 2; ♀ fig. 1; ♂ under side fig. 3.

## THE MARBLES. Genus EUCHLOE Hbn.

EDWARDS' MARBLE *(Euchloe creusa hyantis* Edw.) is a southern race of a species which is rather widely distributed through the southwestern states, all the forms of which are rare, and much sought after by collectors. *Hyantis* ranges through central to northern California, being taken at all elevations. In the lowlands it is in flight early in the spring, but at high elevations its appearance is retarded until as late as June or early July. The typical *creusa* is not shown, as it is a northerly insect. *Hyantis* may be distinguished from the southern race, *lotta,* by the heavier green mottling of the under side, and the narrow clear-cut mark at the end of cell in primaries. It is smaller than *ausonides,* and the white spots between the green marbling on secondaries are of a more pearly lustre. All the forms of this species seem to prefer a semi-desert environment, and are hence more commonly met in territories to the east of our principal mountain ranges or in districts of rather scant rainfall.

Early Stages. Very little is known of these.

Caterpillar. Head and body, apple green, very minutely dotted with black, and with a fine white stigmatal stripe.

Larval food-plants. *Cruciferæ.*

Illustrated. Plate 10. ♂ fig. 4; ♂ under side fig. 5.

THE SOUTHERN MARBLE *(Euchloe creusa lotta* Beut.) is distinguished from the former race by the larger black patch at end of cell, and the more restricted green marbling on the under side of secondaries. It is the earliest butterfly to appear on our southern deserts, frequently being taken in February in the Coachella Valley. March and April are its favored months on the higher Mojave plateau. It does not venture on the coastal plains, but in arid mountainous districts is occasionally encountered.

*Lotta* is the southern race of *hyantis,* and is highly prized by the collector.

Early Stages. Unknown, but probably the same as for the previously treated race.

Illustrated. Plate 10. ♂ fig. 7; ♂ under side fig. 8.

THE LARGE MARBLE *(Euchloe ausonides* Bdv.) occurs in California only on the coastal plains and in the mountains of the central to northern counties. It is never abundant. In the lowlands it is most frequently taken in March, April and May, but the retarded seasons of the alpine regions hold back its appearance in mountainous districts until mid-summer. It flies but a few feet above the ground, in a somewhat zigzag, aimless course, alighting only on flowers.

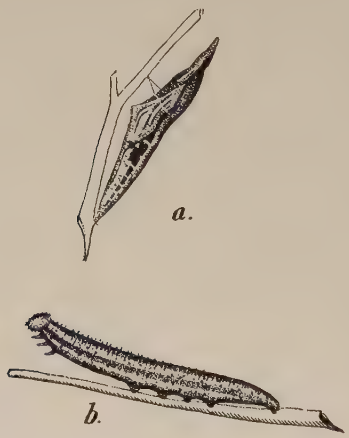


FIGURE A13
EARLY STAGES OF *Euchloe ausonides*
a. CHRYSALIS. b. CATERPILLAR.

EARLY STAGES. Egg. Long; ribbed longitudinally in about 16 ridges. The color when first laid is a bluish-green, changing to a light orange.

Caterpillar. Described in detail, as is also the chrysalis, by Karl Coolidge, in the "Entomological News," of May, 1908. The general color is dark green, with a mid-dorsal and three lateral stripes on each side, of a yellowish or greenish-yellow shade. Figure A13 illustrates the larva and pupa.

Chrysalis. The anterior portion is dark brown, with wing veins marked in a darker shade. Dorsal side of thorax and abdomen a light yellow or cream; ventral side light brown. Five brown lines occur on the abdomen, the mid-dorsal one being most distinct.

Larval food-plants. *Cruciferæ*, particularly species of *Arabis*.

ILLUSTRATED. Plate 10. ♂ fig. 9; ♂ under side fig. 6.

THE YELLOW MARBLE *(Euchloe ausonides flavidalis* Comst.) is a color form of the female of *ausonides* in which the upper surfaces of both sets of wings are suffused with a dull yellow. It is a rarity.

ILLUSTRATED. Plate 10. ♀ fig. 10.

THE HALF-YELLOW MARBLE *(Euchloe ausonides semiflava* Comst.) is another dimorphic female of the above species in which only the upper side of secondaries bears the dull yellow suffusion.

ILLUSTRATED. Plate 10. ♀ fig. 11.

THE COLORADO MARBLE *(Euchloe ausonides coloradensis* Hy. Edw.) is an alpine race of *ausonides,* characterized by smaller size and greener, more restricted marblings on the under surface. It is occasionally taken in the high mountain regions of California, but is relatively more common in Colorado and Utah.

Illustrated. Plate 10. ♂ fig. 13; ♂ under side fig. 14.

## THE MARBLES AND ORANGE-TIPS

### Genus ANTHOCHARIS Bdv.

BOISDUVAL'S MARBLE *(Anthocharis lanceolata* Bdv.) is one of our mountain dwellers, occurring at suitable elevations throughout the Sierras. It is something of a rarity, and must be sought in the late spring, when banks of snow still abound, and the ground is sodden with its melting. It ranges from the central Sierras to the northern border, and beyond, being replaced in our southern mountains by the race *australis.*

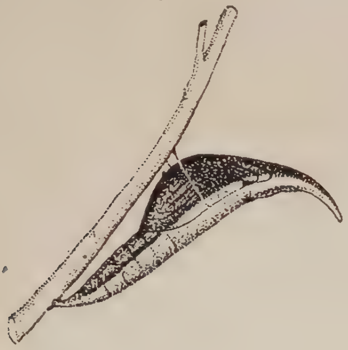


FIGURE A14

Chrysalis of *Anthocharis lanceolata,* Enlarged

Early Stages. These were in part recorded by Mead in "Psyche," Vol. 2, p. 183, and by Karl Coolidge in the "Canadian Entomologist," Vol. 40, p. 130.

Egg. Fusiform, marked by the usual longitudinal ridges, with less clearly defined transverse striations.

Caterpillar. When mature, head pale green, thickly dotted with black. Back of body apple green, shading off laterally into pale blue which is bounded by a distinct bright yellow line just above the spiracles. Next to the yellow line is a slightly broader line of pure white. Each segment above is covered with five black points arranged in transverse rows. On each segment are six minute black tubercles from which fine black bristles arise.

Chrysalis. Shown in Figure A14. It is somewhat larger than that of *A. hyantis,* and is brown in color.

Larval food-plants. The Mustards.

Illustrated. Plate 10. ♂ fig. 15; ♂ under side fig. 18.

GRINNELL'S MARBLE *(Anthocharis lanceolata australis* Grin.) is one of the earliest species to appear in our southern Sierras, with captures recorded from March to May. It is never found in abundance. Wooded canyons with precipitous walls are its chosen environment, and one in which the netting of this agile butterfly is not always an easy matter.

*Australis* may be differentiated from the typical *lanceolata* by the olive-green of the mottling on under surface, and the more clearly defined markings on the apex of primaries. It is single brooded.

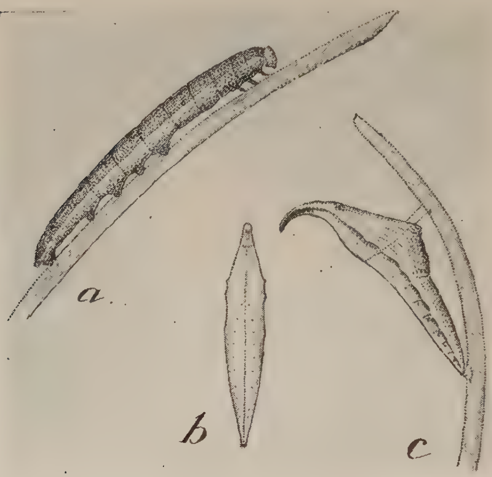


FIGURE A15
EARLY STAGES OF *Anthocharis lanceolata australis*
a. LARVA. b. PUPA, DORSAL VIEW
c. PUPA, LATERAL VIEW
ALL FIGURES SLIGHTLY ENLARGED

EARLY STAGES. Varying only in minor detail from *lanceolata*. Karl Coolidge has recorded the egg and young larva in the "Canadian Entomologist," Vol. XLII, Sept., 1910. The mature larva is green above, flecked with minute spots of white, and covered with white pile so small as to be invisible except with the aid of a glass. Eight minute black papillae occur on the first segment, six of which are in line transversely back of the neck, and two more posteriorly placed. These are tipped with black hairs. Six of these also occur, transversely placed, in the center of second and third segments. A few of these papillae occur on other segments, the most conspicuous of which are a pair on each joint, somewhat anteriorly placed, one on each side of the dorsum; their bases green, giving the appearance of a double row of minute green spots. A wide white stigmatal line, (yellow on first segment) discontinuous on second and third, and very conspicuous posteriorly. This is sharply defined along its upper edge, but fades out as it spreads inferiorly into a mottled white and green area. Abdomen a mottled gray-green. True legs, green, tinged with brown. Prolegs as on abdomen. Head green, profusely covered with small black nodules, (microscopic) bearing white or gray pile. Ocelli black, the uppermost tipped with green. See fig. A15. The description is from a single example, and there is probably wide variation in individuals.

Chrysalis. In a single example observed the shape was exactly that of *lanceolata*, but the color was at first an olive green, darker on head and palpi cases, later changing to a slaty gray-brown overcast with white. A dark line defines the dorso-lateral edge, and a white area edges this ventrally. See Plate 63, fig. 10.

Larval food-plants. Species of *Arabis*, including *A. arcuata*.

ILLUSTRATED. Plate 10. ♂ fig. 12; ♂ under side fig. 16.

FELDER'S ORANGE-TIP *(Anthocharis cethura* F. & F.) is one of our rarest orange-tips, occurring very sparingly throughout California. Its favorite haunts are barren mesas and the summits of small desert hills. Certain regions of the Mojave Desert are a favorite hunting ground for this choice species. Only occasionally is it taken on the coastal plains. Late February to April finds it on the wing.

EARLY STAGES. Egg. Subfusiform, the base flattened, swelling out roundly to the middle but narrowing rapidly as the truncated summit is reached; marked by a series of straight, sharp, longitudinal ribs, averaging about seventeen in number. Nearly every alternate rib terminates before reaching the apex. Between these ribs are rather strongly marked cross lines. The color, when first laid, is a light bluish-green, but changes later to orange. The micropyle area is of a slightly deeper tint.

Caterpillar and chrysalis. Nothing is known of these.

Larval food-plants. The wild mustards.

ILLUSTRATED. Plate 10. ♂ fig. 19; ♀ fig. 20; ♂ under side fig. 21.

MORRISON'S ORANGE-TIP *(Anthocharis cethura morrisoni* Edw.) is an exceedingly rare form of the above species in which the green mottling of the under surface is much darker and heavier than in the typical insect. The example shown on the color plate was lent by Dr. William Barnes.

ILLUSTRATED. Plate 10. ♂ under side fig. 17.

THE DESERT ORANGE-TIP *(Anthocharis cethura deserti* Wright) is a variant of *cethura* in which the orange spot is much reduced, and usually of a lighter shade; occasional examples showing a complete suppression of it. The form is appropriately named, as it is only found in desert regions. It is represented in few collections.

Illustrated. Plate 11. ♂ fig. 1; ♀ fig. 3.

THE TINTED DESERT ORANGE-TIP *(Anthocharis cethura caliente* Wright) is a phase of the last named insect in which a yellow suffusion occurs on both primaries and secondaries. It is usually listed as a form of *Anthocharis pima*, but an examination and comparison of the type seems to prove that it belongs with *cethura*. It is a unique.

Illustrated. Plate 11. ♀ fig. 2.

THE PIMA ORANGE-TIP *(Anthocharis pima* Edw.) is by far the handsomest member of the genus occurring in our territory. It is a rare capture in California, being reported only from the regions adjacent to the Colorado River. Even in its preferential range through portions of Arizona, it is by no means common.

The insect may be distinguished from other *Anthocharids* by the deep yellow suffusion occurring over the wings in both sexes. *Pima* is fond of sporting over the tops of small desert hills and buttes, much after the fashion of *cethura*. It is on the wing in March and April.

Early Stages. Little is known of these. The egg and caterpillar are as yet undescribed.

Chrysalis. Thin; sub-cylindrical. The palpi case is straight, not recurved, as in several other species. Color, light mouse brown, streaked and speckled with darker shades.

Illustrated. Plate 11. ♂ fig. 4; ♀ fig. 6; ♂ under side fig. 5.

THE SARA ORANGE-TIP *(Anthocharis sara* Bdv.) is a somewhat variable member of the genus, in consequence of which several forms and seasonal varieties have been named. It is double-brooded throughout most of its range, which includes the mountain states of the Pacific coast. The first form to appear, from overwintering chrysalids, is *reakirtii*, which is hereafter treated. Typical *sara* represents the second generation, and is characterized by a lesser amount of green marbling on the under side of wings, and somewhat reduced black markings of the superior surfaces. It averages larger in size than *reakirtii*. Although a common insect, it never appears in as great abundance as the earlier brood. Late May and early June are its favored periods of flight. This beautiful spring butterfly never fails to bring a thrill of delight to the lepidopterist, as it pursues its impetuous course through our wooded canyons, or sports over the mustard-spangled foothills in search of *Arabis* or *Raphanus* on which to oviposit. It is found at practically all altitudes, but seems to prefer the foothill country and adjacent meadowlands.

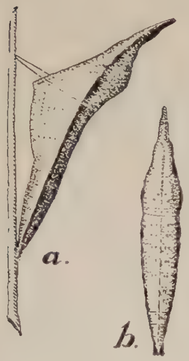


FIGURE A16
CHRYSALIS OF
*Anthocharis sara*,
ENLARGED
a. LATERAL VIEW
b. DORSAL VIEW

EARLY STAGES. In spite of its abundance, these have remained practically unknown.

Egg and caterpillar. Undescribed.

Chrysalis. Illustrated in Figure A16. The color of all examples that have come to our notice is a soft brown, with the head and palpi cases darker, and a dark line along the dorso-lateral edge. Ventral to this line is a white area, shading into the brown.

Larval food-plants include the wild radishes and mustards.

ILLUSTRATED. Plate 11. ♂ fig. 7; ♀ fig. 9; ♂ under side fig. 8.

THE STELLAR ORANGE-TIP *(Anthocharis sara stella* Edw.) is a dimorphic form of the female of *A. sara*, in which a yellow suffusion covers the upper surface of both wings. This tint may occur in varying degrees, some examples showing only a trace of it.

ILLUSTRATED. Plate 11. ♀ fig. 15.

REAKIRT'S ORANGE-TIP *(Anthocharis sara reakirtii* Edw.) is the first brood of this species, and makes its appearance in the early spring, sometimes flying in February, and reaching the apex of its abundance in March and April. It may be differentiated from typical *sara* by the heavy green mottling of the under surface, the accentuated dark points at end of nervules on upper side of secondaries, and the increased amount of black on primaries. A yellow form of the female is occasionally encountered.

Illustrated. Plate 11. ♂ fig. 10; ♀ fig. 12; ♂ under side fig. 11; ♂ dwarf, fig. 17; ♀ aberrant form, fig. 18; ♀ yellow form *stella*, fig. 13.

WRIGHT'S ABERRANT ORANGE-TIP *(Anthocharis sara reakirtii* ab. *wrighti* Comst.) is a heavily suffused aberration of the male in which the black scales practically obscure the orange spots of primaries, and spread along the nervules on secondaries so as to give a striated appearance. So far only one example is known.

Illustrated. Plate 11. ♂ fig. 16.

THE JULIA ORANGE-TIP *(Anthocharis sara julia* Edw.) is a rare form occurring at high altitudes, in which a delicate, hardly distinguishable, yellow tint covers the superior surfaces, and the black band separating the orange spot from the white area of the primaries is narrowed, and disappears at one point. The female of this form is practically indistinguishable from *A. sara stella.*

Illustrated. Plate 11. ♂ fig. 14.

## THE LARGE SULPHURS. Genus CATOPSILIA Hbn.

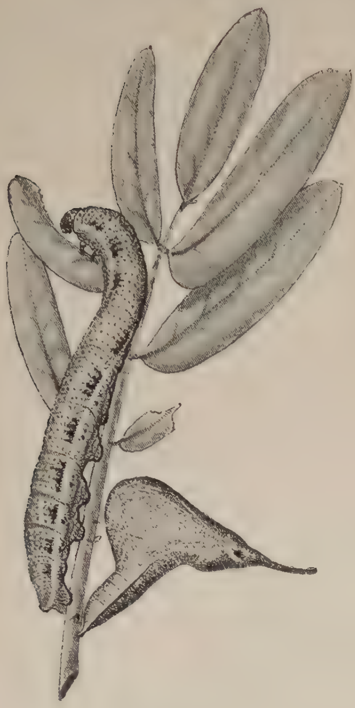


FIGURE A17
Early Stages of *Catopsilia eubule sennæ*. The Caterpillar Slightly Enlarged, and Shown Feeding on *Cassia*

THE SENNA SULPHUR *(Catopsilia eubule sennæ* L.) is that particular race of the Cloudless Sulphur which comes within the territory embraced by this work. This brightly colored and agile butterfly is a familiar sight as it dodges through the gardens and parks of southern California, in search of the yellow *Cassia* blossoms. On account of its rapid flight it is secured more readily by breeding. It flies from February to December, and there is probably a succession of broods to account for its extended season. One finds it more commonly in settled districts, and it is rarely encountered at high elevations. Santa Barbara is the most northerly limit in our state of which we have record.

Early Stages. Egg. Illustrated in Figure A18. The color is orange-yellow.

Caterpillar. When mature, variable in color and pattern. The predominating type is green above, with minute black nodules thickly scattered over the surface. A yellow lateral stripe runs the length of the body, and along its upper edge there are a series of blue points. Occasionally yellow forms occur, some of which are banded with blue. These are found more commonly feeding on the blossoms. All of the varieties turn a translucent yellow before pupation. See Figure A17.

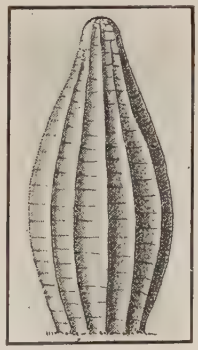


FIGURE A18
Egg of *Catopsilia eubule sennæ*. Greatly Magnified

Chrysalis. Somewhat variable, ranging from a beautiful pink to a vivid green. All have a yellow lateral stripe outlined below with green. Antennal sheaths yellow. The position of the nervules on the wing cases is indicated by nar-

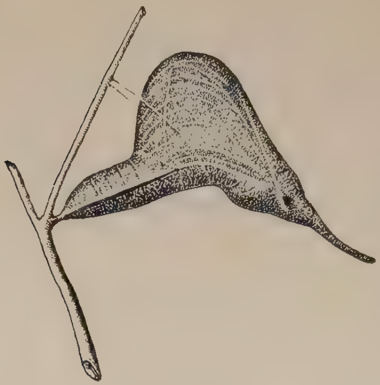


FIGURE A19

Chrysalis of *Catopsilia eubule sennæ*, Enlarged

row greenish lines. Figure A19 illustrates this stage. See also colored illustration on Plate 63, fig. 7.

Larval food-plants. The *Cassias*, and probably also Clovers. The yellow flowering bushes of the first named group are frequently used in gardens and parks as ornamental shrubs. They are introduced exotics, that occur abundantly in Mexico. There are also two native *Cassias* indigenous to our southern deserts.

Illustrated. Plate 13. ♂ fig. 1; ♀ figs. 3 and 4; ♀ under side fig. 2.

THE PALLID SULPHUR *(Catopsilia eubule sennæ* form *pallida* Ckll.) is an albinic female of the Senna Sulphur, which is exceedingly rare in this state. Various degrees of this albinism seem to occur, some specimens showing only a slight lightening of the yellow, as in our figure 4 of plate 13. This example is actually lighter than the plate would indicate.
Illustrated. Plate 13. ♀ fig. 5.

## THE DOG-FACES. Genus ZERENE Hbn.

THE CALIFORNIA DOG-FACE *(Zerene eurydice* Bdv.) ranges from Mendocino County in the north to our southern border, and beyond. The male of this species is one of our most beautiful butterflies. The violet-rose suffusion occurring on the forewing, in certain lights is difficult to portray, and must be seen in the fresh living specimen to be fully appreciated. One must swing an agile net to capture the Dog-faces on the wing, but fortunately they stop occasionally to sip nectar, or drink from moist spots, and they may then be readily taken. Alfalfa bloom is particularly alluring to them. *Eurydice* is subject to seasonal dimorphism, and rather wide variation. It is double brooded; the spring generation flying at its best in April and May, and the second brood predominating in July and August. A few strays, flying as late as November, may represent an abortive third generation. Typical *eurydice* is characterized by immaculate secondaries. The lower mountain ranges and foothills are its chosen habitat, but occasionally examples are taken on the coastal plains and inland valleys.

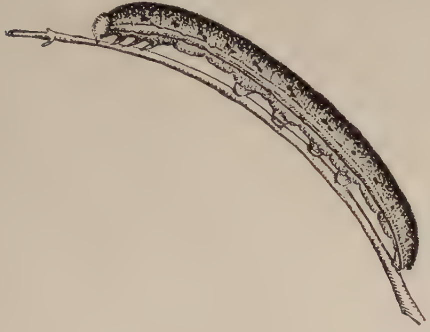


FIGURE A20
CATERPILLAR OF *Zerene eurydice*, ENLARGED

EARLY STAGES. These have been recorded in detail by Edwards in his masterful work on the "Butterflies of North America."

Egg. Similar in form to the eggs of the Common Sulphurs *(Eurymus)*. Color, yellow-green.

Caterpillar. When mature, of a dull green, with variable markings, the predominating type having a stigmatal white line, edged below with orange. Above this, in each segment, is a blackish spot, sometimes continued over the back as a line, thus giving a banded appearance. The body is covered with minute black tubercles and hairs. See Figure A20.

Chrysalis. The shape is portrayed in Edwards' "Butterflies of North America." Color, apple-green.

Larval food-plant. False indigo or lead-plant, *Amorpha californica.*

ILLUSTRATED. Plate 12. ♂ figs. 1 and 2; ♀ figs. 5 and 6; ♀ under side, fig. 9.

THE MARGINED DOG-FACE *(Zerene eurydice bernardino* Edw.) is the name which has been applied to that form of the male in which a black band extends into the margin of the secondaries. W. S. Wright was of the opinion that this form predominated in higher altitudes. Every intergrade occurs between this black banded variety and the typical insect with immaculate secondaries. Plate 12, fig. 2, pictures an example that is about intermediate in the extent of this banding.

ILLUSTRATED. Plate 12. ♂ fig. 3.

GUNDER'S ABERRANT DOG-FACE *(Zerene eurydice* ab. *fanniæ* Gunder) is a "freak" in which the cell of primaries is obscured with black. Only one example is at present known.

ILLUSTRATED. Plate 12. ♂ fig. 8. (type.)

NEWCOMB'S ABERRANT DOG-FACE *(Zerene eurydice* ab. *newcombi* Gunder) is another aberration, differing from the typical insect in the fact that the ground color is a light yellow, instead of an orange. The type is pictured.

ILLUSTRATED. Plate 12. ♂ fig. 10.

THE CLOUDED DOG-FACE *(Zerene eurydice amorphæ* Hy. Edw.) is a rare form of the female of *Z. eurydice* in which dark markings appear on the forewings that are suggestive of those in the female of the Southern Dog-Face, *Z. caesonia.* The extent of this darkening is highly variable, ranging all the way from a mere trace, as in fig. 6 of Plate 12, to examples so dark as to be practically indistinguishable from *caesonia.* The factors which produce this variation are at present unknown. Some authors are of the opinion that it is a case of atavism, or a "casting back" to an ancestral type—a common prototype of all members of the genus. Others are inclined to the belief that it represents a cross-breeding of the two species, *caesonia* and *eurydice.* If either of these explanations were true it would seem that the male would show similar tendencies, and such is not the case. Here is a problem on which some of our younger entomologists may profitably work.

ILLUSTRATED. Plate 12. ♀ fig. 7.

THE SOUTHERN DOG-FACE *(Zerene caesonia* Stoll) occurs in the southern counties of California, but is by no means common as it is in some of the Gulf States. The colored figures serve to differentiate it from *eurydice* without the need of further description. *Caesonia* is probably double brooded, as freshly emerged specimens are recorded for April and July.

EARLY STAGES. These have been recorded many times by various authors, and particularly by Edwards in the "Canadian Entomologist," Vol. 20, p. 21.

Larval food-plants. *Amorpha,* and also the clovers.

Illustrated. Plate 12. ♂ fig. 11; ♂ under side fig. 12; ♀ fig. 13.

THE ROSEATE DOG-FACE *(Zerene caesonia rosa* M'Neill) is a form of *caesonia* in which a rich "splashing" of rose suffuses the under side of the wings. This occurs only in the fall brood, and is most marked in specimens from the eastern states. The example illustrated on Plate 12 bears only a small amount of this roseate hue. It is an Arizona capture, and for that reason is included in the hope that examples similar to it may be taken in California. As yet we have no records of the occurrence of *rosa* in this state.

Illustrated. Plate 12. ♀ under side, fig. 4.

## THE SULPHURS. Genus EURYMUS SWAINS.

BOISDUVAL'S SULPHUR *(Eurymus eurytheme* Bdv.) is a polymorphic species, occurring in a variety of forms, some of which are seasonal or altitudinal, and others albinic. The typical insect is the spring form, emerging from overwintering chrysalids. It is smaller than the summer form, and bears less of the orange suffusion.

There is hardly a month of the year in which we may not see some one of the forms of this butterfly on the wing in our rural districts. It fairly swarms at certain seasons during years that are favorable to its multiplication, and is at times a menace to the agriculturist. On such occasions it is a familiar sight to see the radiators of automobiles literally plastered with these yellow beauties.

*Eurytheme* is found throughout the west, at suitable elevations, being more plentiful in the lowlands. A dark and much suffused aberration of this species has been described by Strecker, under the name *suffusa,* but we have not as yet seen California examples. An albinic form of the female *(Eurymus eurytheme* ab. *alba* Stkr.)

is comparatively common, and is figured on plate 14, figs. 1 and 2.

Early Stages. These are probably similar for all of the forms, and will be dealt with here for the group. They have been described in detail by several authors—most notably by W. H. Edwards in his "Butterflies of North America," second series.

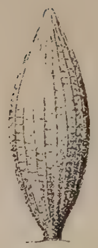


FIGURE A21
Egg of *Eurymus eurytheme*, Greatly Magnified

Egg. Fusiform, tapering evenly from the middle to each extremity, with a pointed summit. It bears the longitudinal ribs and cross striations characteristic of the eggs of all members of the genus. The color is buff-white to crimson, becoming darker as it nears maturity. See Figure A21.

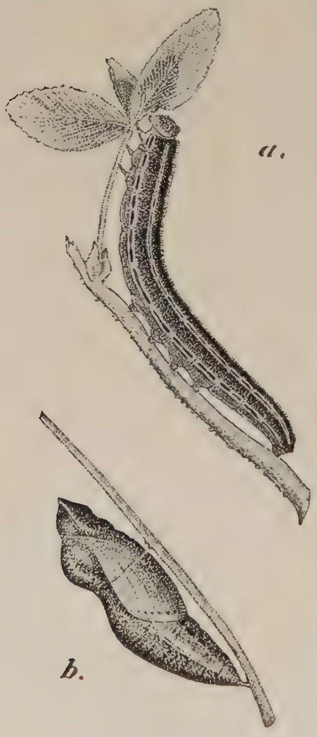


FIGURE A22
Early Stages of
*Eurymus eurytheme*
a. Caterpillar Feeding on Sprig of Clover.
b. Chrysalis, Slightly Enlarged.

Caterpillar. This is shown in Figure A22. It is covered with minute white hairs, arising from either white or black microscopic papillae. The body color is dark green. A basal white line runs longitudinally, in which is enclosed a narrow crimson line. A subdorsal narrow line of similar character is also present. A number of black dots are distributed at various points. The markings are somewhat variable.

Chrysalis. Green, with lateral yellow dashes, and a number of black points and streaks. See Figure A22b.

Larval food-plants. Clovers, rattleweed *(Astragalus)*, deerweed, sweet clover *(Melilotus)*, alfalfa, etc.

Illustrated. Plate 13. ♂ figs. 6 and 7; ♀ figs. 9 and 10; ♂ under side fig. 8; ♀ under side fig. 11.

THE FLAVID SULPHUR *(Eurymus eurytheme amphidusa* Bdv.) is the summer brood of the previous species. No other member of the order Lepidoptera is so aptly called "butterfly," or flying-butter as is this handsome insect. In another sense than that of color, it deserves this title, for the Sulphurs are voracious destroyers of clover and alfalfa, which, if allowed to grow and be translated, via the dairy route, into milk, would eventually result in butter. Each of these yellow beauties represents, therefore, just so much butter that has taken wing from the profits of the farmer.

This form has an albinic female, designated *alba* Stkr. which is illustrated on Plate 14, fig. 3. The phenomena of albinism in the Genus *Eurymus* is one of great interest. Many of the species produce occasional white females. Others, as in the case of the Colorado species, *E. scudderi,* have white females as the normal form, with only an occasional yellow. A few, as with the arctic species, *E. pelidne,* produce only white females in association with yellow males.

A rare form of *amphidusa* is occasionally observed in which the orange suffusion is entirely suppressed on the upper surfaces, leaving only a clear yellow. This was named *flava* by Strecker, and was lately redescribed by Gunder as *unicitrina,* the latter name therefore becoming a synonym.

Illustrated. Plate 14. ♂ fig. 4; ♀ fig. 6; ♂ under side fig. 5.

THE YELLOW SULPHUR *(Eurymus eurytheme eriphyle* Edw.) is a high altitude summer form of this variable species in which the ground color of both upper and under surfaces of the wings is a clear lemon-yellow. This is the form which predominates in the Mono Basin, and the high plateaus of the northern regions of our state. It is often found flying in association with *amphidusa.*

Illustrated. Plate 14. ♂ fig. 7; ♀ fig. 8; ♀ under side fig. 9.

COCKERELL'S SULPHUR *(Eurymus eurytheme autumnalis* Ckll.) represents the early spring brood of the above form resulting from overwintering chrysalids. It is smaller than *eriphyle,* and the under surface is more heavily dusted with black. Occasionally specimens of this form are taken in the fall, probably as a result of an early cold spell influencing the pupa. It was probably a late example such as this which came to Prof. Cockerell's notice, and caused him to designate it *autumnalis*.

In comparison with other members of the group it is a rare insect.

Illustrated. Plate 14; ♂ fig. 10; ♀ fig. 12; ♂ under side fig. 11.

THE GOLDEN SULPHUR *(Eurymus occidentalis chrysomelas* Hy. Edw.) is one of our rarer forms, limited in range to the northern counties, where it is occasionally encountered in the months of May, June and July. It is the largest member of the genus occurring in California, and is separable from other species by the rich suffusion of golden-yellow covering the under surfaces of wings, and the clear pink borders.

Early Stages. Practically nothing is known of these.

Larval food-plants. Probably various species of the *Fabaceæ*. (Bean family).

Illustrated. Plate 15. ♂ fig. 9; ♀ fig. 7; ♂ under side fig. 10.

An albinic female of *chrysomelas* was recently described by Drs. Barnes and Benjamin, as form *shastæ*. It is characterized by the fact that the normal bright yellow color is replaced by yellowish-white, and the discal spot on hind wing is whitish instead of the usual orange.

THE BARBARA SULPHUR *(Eurymus occidentalis barbara* Hy. Edw.) is a southern dwarfed race of *chrysomelas* with more rounded forewings, and heavy shading in the basal area of the upper surfaces. It is exceedingly rare. One of the type specimens was taken at Santa Barbara, but we have never seen examples captured south of Sonoma County. The example figured is the one used by Dr. McDunnough in his study of the species, as recorded in Barnes and McDunnoughs' "Contributions," Vol. 3, p. 66. It is reproduced through the courtesy of Dr. Barnes. The form has long been confused with *E. harfordii*, partly as a result of Wright's figures, which are misidentified.

Illustrated. Plate 15; ♂ fig. 8.

HARFORD'S SULPHUR *(Eurymus harfordii Hy.* Edw.) is common in the mountains of Southern California, and is taken with increasing rarity as it approaches the northern limit of its range in Contra Costa and adjacent Counties. The clear lemon-yellow ground color of both surfaces, and absence of shading in the basal area of upper side will serve to separate it from other species.

Harford's Sulphur is double-brooded, the spring generation showing a tendency toward slightly deeper color. It is this brood that has long been called *barbara* by various authors. It is on the wing from about February to May, and never reaches the abundance of the summer brood. The second generation begins to make its appearance in late June or July, and is fairly plentiful from then on to late August. All intergrades occur between these two hardly separable forms, and the one designation of *harfordii* is sufficient to include all of them. There is considerable variation, particularly in the females, of which several forms are shown.

An aberration of the female designated *weaveræ* was described by Jean Gunder, in the "Entomological News," of May, 1924. It differs from the typical insect in having an orange suffusion over the basal, and part of the discal areas of the upper surfaces. A colored figure is shown on Plate II of the issue above referred to.

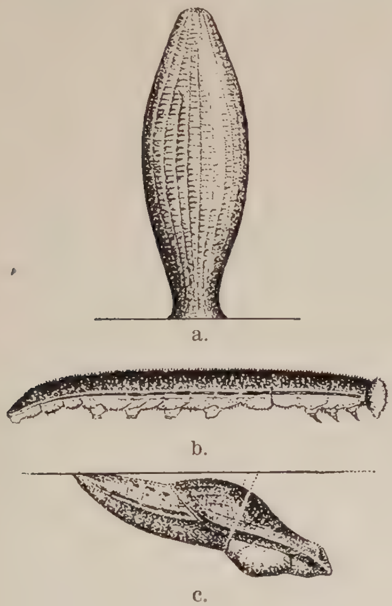


FIGURE A23
Early Stages of
*Eurymus harfordii*
a. Egg, Greatly Magnified
b. Caterpillar, Slightly Enlarged
c. Chrysalis, Enlarged

Early Stages. These were recorded by W. H. Edwards in "Papilio," Vol. 4, pp. 2 and 3, and also in his Vol. 3, "Butterflies of North America."

Egg. Figure A23a serves to show the form. Color, yellow-green, changing later to crimson.

Caterpillar. Green, with a lateral white line in which is enclosed a narrow strip of vermilion. The body is covered with minute black tubercles bearing short hairs. Illustrated in Figure A23b.

Chrysalis. Pictured in Figure A23c. Similar in form to the pupa of other members of the genus. The color is yellow-green—the abdomen more yellow than elsewhere, and granulated with pale yellow. Along the side of the abdomen is a bright yellow band, through which runs a red or ochreous line; on ventral side a line of small ferruginous spots; on middle of wing-case a blackish dot, and a series of marginal points. Different chrysalids vary somewhat in their coloration.

Larval food-plant. Rattleweed *(Astragalus)*.

ILLUSTRATED. Plate 15. ♂ fig. 1; ♀ figs. 3, 4, 5 and 6; ♀ under side fig. 2.

EDWARDS' SULPHUR *(Eurymus alexandra edwardsii* Edw.) is a western race of a Rocky Mountain species, *(E. alexandra)*, which occurs in the Mono Basin, the high desert plateaus east of the Sierra Nevadas, and the arid lands to the north. It is exceedingly rare in California, but is somewhat more common in parts of Nevada and Oregon. The clear unspotted yellowish-white of the under side will serve to differentiate it from other species. The females usually bear more dark scaling than is shown in our colored figure. Edwards' Sulphur is on the wing in July and August.

Drs. Barnes and Benjamin have recently described an albinic female of this race, designated *hatui*. The types were taken in Utah, and no examples are recorded from California, but it may later be found in the Mono Basin.

EARLY STAGES. Unknown, but probably similar to those of *E. alexandra*, which have been in part described by W. H. Edwards in the Supplemental Notes to his work on "North American Butterflies."

Caterpillar. Uniformly yellowish-green, with a white band on each side, and broken orange dashes running through it. Head yellow-green.

Chrysalis. Shape of the eastern *E. philodice;* color, yellow-green —the dorsal side darkest. On ventral side of the abdomen next to the wing cases there are three small reddish spots in line.

Larval food-plants. *Astragalus* and *Thermopsis.*

ILLUSTRATED. Plate 15. ♂ fig. 13; ♀ fig. 11; ♂ under side fig. 12.

BEHR'S SULPHUR *(Eurymus behrii* Edw.) was at one time considered our rarest species of the group on account of its restricted range, comparative isolation, and short season. To secure it, one must scale our noble Sierras in mid-summer and seek the glacial flower-strewn meadows. In sunny days of late July it fairly swarms in favored localities above Yosemite. Mineral King seems to be about its southern limit.

Early Stages. These were in part described by Dr. Dyar, in the "Canadian Entomologist," Vol. 25, p. 158.

Egg. Spindle-shaped, a little contracted just below the tip, with low longitudinal and transverse ridges.

Caterpillar. When mature, green, with a fine pinkish-white dorsal line finely bordered with black, running nearly the length of the body; a broader even sub-dorsal line nearly white on the edges, salmon colored centrally, and bordered above by black lunate discontinuous spots, one on each segment. A similar very even sub-stigmatal band, pinkish centrally, with a blackish border, which extends superiorly to surround the spiracles.

Chrysalis. Similar in shape and marking to other members of the genus.

Larval food-plants. Dwarf billberry *(Vaccinium caespitosum)* and *Gentiana newberryi.*

Illustrated. Plate 16. ♂ fig. 1; ♀ fig. 3; ♂ under side fig. 2.

BEHR'S ALBINIC SULPHUR *(Eurymus behrii canescens* Comst.) is a white form of the female of the above species, which seems to be quite as plentiful as the yellow form. It is not as clearly contrasted as is the case with albinic females of other species, on account of the greenish suffusion, which obscures the ground color. The figure is a little more yellow than is the actual type specimen.

Illustrated. Plate 16. ♀ fig. 4.

## THE SULPHURS and SMALL SULPHURS
## Genus EUREMA Hbn.

THE MEXICAN YELLOW *(Eurema mexicana* Bdv.) is an occasional capture in the southern counties of California. It is evidently double brooded, as records are available for the spring and fall months. More commonly it is reported from lowland semi-desert areas, but an infrequent specimen finds its way into the mountainous districts.

The triangular projection of the secondaries into a semblance of a tail serves at once to differentiate this species.

Early Stages. Little is known of these, but they are probably quite similar to other members of the genus.

Larval food-plant. *Cassia.*

Illustrated. Plate 16. ♂ fig. 5; ♀ fig. 7; ♂ under side fig. 6.

THE NICIPPE YELLOW *(Eurema nicippe* Cram.) is our most abundant member of the genus in Southern California, due to the frequent use of introduced *Cassias* as ornamental garden shrubs. Santa Barbara is about the northern limit of its range. The species breeds continuously throughout the greater portion of the year, the first generation appearing in April or May, and the insect becoming increasingly plentiful as the season advances, until the first cold spell of our short winter puts it out of commission.

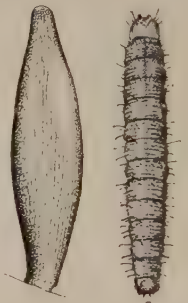


FIGURE A24
a. EGG OF *Eurema nicippe,* GREATLY MAGNIFIED
b. NEWLY EMERGED CATERPILLAR OF *E. nicippe,* GREATLY MAGNIFIED

EARLY STAGES. These were described by W. H. Edwards in the "Canadian Entomologist," Vol. 13, p. 61.

Egg. Elongate, spindle-shaped, tapering at both ends, and ribbed with low longitudinal lines. There are a few transverse striations at the upper end. Color, light greenish-yellow, changing to a deeper tint, and assuming a reddish hue before emergence. See Figure A24a.

Caterpillar. When mature, a velvety green, with a fine whitish-yellow stripe, laterally placed. The newly emerged larva is illustrated in Figure A24b.

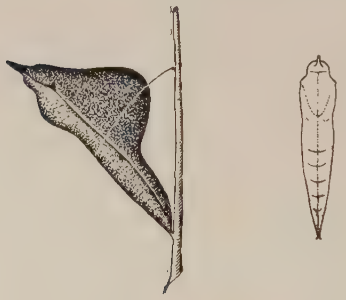


FIGURE A25
CHRYSALIS OF *Eurema nicippe,* SLIGHTLY ENLARGED

Chrysalis. The illustration, Figure A25, renders a description unnecessary. Color, olive-green, with occasionally a few russet spots. See also Plate 63, fig. 11.

Larval food-plants. *Cassia* and other *Leguminosæ.*

ILLUSTRATED. Plate 16. ♂ fig. 8; ♀ fig. 10; ♂ under side fig. 9; dwarf ♀ fig. 15.

THE LITTLE SULPHUR *(Eurema lisa* Bdv. & Lec.) [synonym *euterpe* Men.] has been listed for California by one of the early collectors, but later work over a period of many years has failed to substantiate the record. It is comparatively common in southern Arizona, and there seems to be no reason why it should not become established in this state, in view of favorable climatic conditions and abundance of food-plant.

Early Stages. Egg. Shaped somewhat like a nine-pin, with numerous vertical ridges. Color, light green.

Caterpillar. Grass-green, covered with minute pile. A pallid line occurs laterally, along the spiracles.

Chrysalis. Translucent green with a few black dots. As with other species in the genus, the anterior extremity is pointed.

Larval food-plants. *Cassia* and clover.

Illustrated. Plate 16. ♂ fig. 11; ♀ fig. 13; ♂ under side fig. 12.

THE DELIA SULPHUR *(Eurema demoditas* Hbn.) [synonym *delia* Cram.] is another species recorded for the state in the early days, and of which no confirmation has since been made. It is normally an inhabitant of the Gulf States. The uniform rich reddish color on under side is the characteristic feature of this species.

Early Stages. These are probably similar to *lisa.*

Illustrated. Plate 16. ♀ fig. 14; ♂ under side fig. 16.

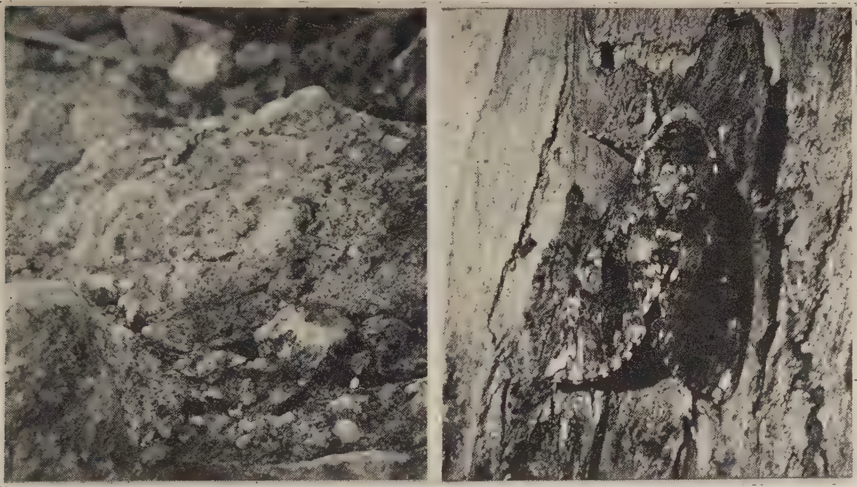


PLATE A

Illustrating Protective Coloration

The figure on the left shows a tree-toad which simulates the color of the rock so perfectly as to be almost indistinguishable

The right hand figure shows a protectively colored moth on a piece of bark

—Photo, Courtesy W. Scott Lewis.

## Family Danaidae

THE Danaids are remarkably developed in the tropics of both the Old and New Worlds. They are about intermediate in size between the Pierids and Papilionids, although some of the South American Ithomiidæ are comparatively small.

The prevailing colors in the group are subdued, although the patterns are frequently bold and distinctive.

The family is poorly represented in temperate North America, only two distinct species occurring in California.

It is in this group that we find the greatest number of protected species, if we exclude the tropical Heliconiids. Nearly all of the forms possess acrid qualities that furnish them immunity from attack by insectivores. In consequence of this they serve as models for a wide range of mimicry.

### THE MILKWEED BUTTERFLIES. Genus DANAUS L.

THE MONARCH *(Danaus menippe* Hbn.) is the best known of our native butterflies, occurring as it does abundantly in every part of the continent. It is as stable and dependable as its name seems inconstant, for it has appeared variously in past publications as *Anosia plexippus,* and *Danais archippus,* and now makes its bow as *Danaus menippe.* We venture the hope that all of the ancient literature touching on this familiar insect has now been fine-combed by the specialist, and that no archaic designation remains to be unearthed, to come forth on the established rule of priority and tumble *menippe* into the discard. The Monarch belongs to a group of butterflies that are believed by many writers to have obnoxious qualities which render them immune to the attacks of insectivores. This probably accounts in part for its abundance and longevity, for the Monarch lives weeks or months to the average butterfly's days.

The species is polygoneutic, or, in other words, produces a succession of broods throughout the year. It is incapable of passing the winter in any of its phases in the northern states and must therefore be annually restocked by migration from the south.

Of the several species of butterflies which move in occasional swarms, this is the only one in North America that can be designated a true migrator. It is an inspiring sight to see one of these flights in the fall of the year, heading southward, composed of millions of individuals. The spring movement northward is of a totally different character. There is no swarming instinct associated with it, and hence it is seldom noticed.

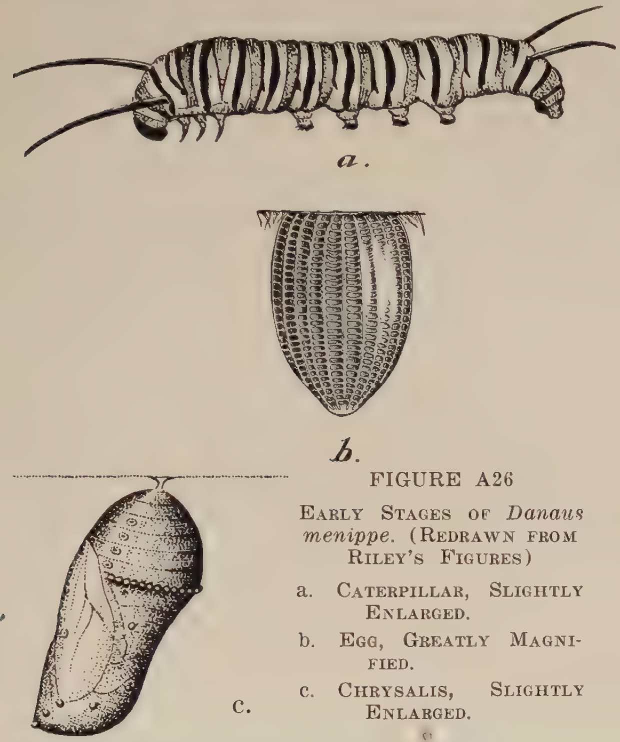


FIGURE A26

Early Stages of *Danaus menippe.* (Redrawn from Riley's Figures)

a. Caterpillar, Slightly Enlarged.
b. Egg, Greatly Magnified.
c. Chrysalis, Slightly Enlarged.

Early Stages. These have been repeatedly recorded and frequently illustrated.

Egg. Figure A26b portrays the form. In color it is a delicate pale green.

Caterpillar. Adequately pictured in Figure A26a. The ground color is greenish, on which bands of black and yellow are superimposed.

Chrysalis. This is a beautiful object, and it has been appropriately designated "the little green house with gold nails," on account of its pale green color and raised lustrous metallic spots. See Figure A26c.

Larval food-plant. Milkweed.

Illustrated. Plate 17. ♂ fig. 2; ♀ fig. 1.

THE SMOKY MONARCH *(Danaus menippe* ab. *fumosus* Hlst.) is an aberration of the former species in which the ground color is of a smoky gray-brown, instead of the characteristic rich red-brown of the typical insect. It is relatively rare.

Illustrated. Plate 17. ♀ fig. 3.

THE STRIATED QUEEN *(Danaus berenice strigosa* Bates) is not as common an insect in California as it seems to be in Arizona and Texas. It is, in fact, counted something of a rarity, and only occurs in a few isolated points in the southern part of the state. Imperial Valley is its favored location. Occasional captures have been reported as far north as Mono County. Records are available of its having been taken from April to November, with probably a succession of broods to account for its long season.

EARLY STAGES. These were recorded by Karl Coolidge in "Transactions American Entomogolical Society," Vol. 52, p. 27.

Caterpillar. Whitish violet, with transverse stripes of a deeper color; a transverse band of reddish-brown on each segment, divided in its length by a narrow yellow band; along the feet a longitudinal yellowish band. Long fleshy processes of a brownish-purple arise from the second, fifth and eleventh segments, disposed in pairs.

Chrysalis. Similar to that of the Monarch.

Larval food-plants. *Asclepias* and *Nerium.*

ILLUSTRATED. Plate 17. ♀ fig. 4; ♀ under side fig. 5.

KERR'S ABERRANT QUEEN *(Danaus berenice strigosa* ab. *kerri* Comst.) is a variant of the above species in which all of the white spots are lacking. It was presented to the author by Mr. Laurance T. Kerr, for whom it was named. Only the one example is at present known.

ILLUSTRATED. Plate 17. ♂ (type) fig. 6.

# PROTECTIVE COLORATION AND MIMICRY

All of the animal forms existing on the earth today have, in the past, undergone a series of gradual changes, in response to their surroundings, which have enabled them to survive in the face of innumerable forces tending toward their destruction.

These changes are in the nature of adaptations, by means of which, through constant improvements, they have adjusted themselves to their special environments.

In the higher vertebrates, these changes have brought about remarkable modifications of the nervous system, more particularly in the brain.

With lower forms of life, adaptive modifications are preponderantly in the nature of color changes, by means of which the animal simulates its environment, and is thus enabled to escape observation.

Most naturalists have noted the close similarity of the color and markings of certain tree-toads and lizards, to the environment in which they are found. See Plate A, page 57.

Many sea-horses are colored like the seaweeds among which they live. The Zostera, of the Florida Coast, for example, has a coloration like that of sea grass.

The young of the British Shore-crab *(Carcinas maenas)* invariably harmonizes with the color scheme of the pool which it inhabits. The Turbit, *(Psetta maxima)* rests flat upon the sea floor, and its upper surface shows the mottled pattern of its sandy cradle.

Thousands of examples of protective resemblance have been noted in the Arthropods. A certain spider, found in California, closely resembles a bird-dropping. The simulation is further heightened by its habit of resting quietly on the upper surface of a leaf, with its legs held close to the body.

Many of the Mantids and Walking-stick insects are modified to resemble sticks, leaves and bark. See Plate B, fig. 3.

A Hemipterous insect occurs in San Diego County, which rests in the blossom of the wild buckwheat. Its form and color so perfectly imitate a portion of the bloom that butterflies frequently alight upon it, and are thus captured.

In the Lepidoptera, protective resemblance may be manifested in one or more of the changes through which the insect passes, in the course of its metamorphosis. A large number of the eggs of

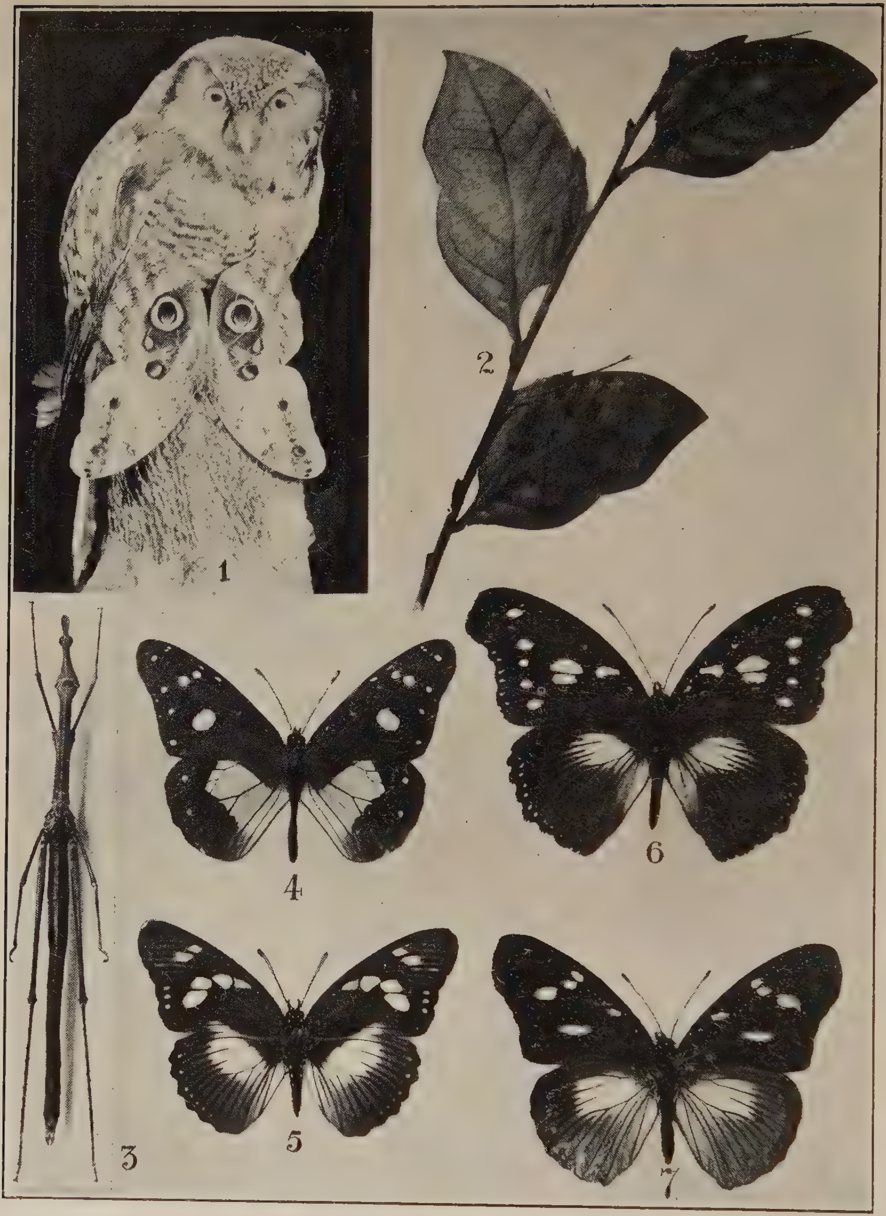


PLATE B

Illustrating Protective Coloration and Mimicry

Fig. 1. The Owl Butterfly of South America shown with an owl for comparison.

Fig. 2. Three Leaf-butterflies (*Kallima inachis*) of India, on twig, showing perfect simulation of leaves.

Fig. 3. Walking-stick insect resembling twigs.

Fig. 4. An *Acreid* Butterfly, protected by acrid qualities.

Figs. 5, 6, 7. Three African Butterflies which mimic the *Acreid* in color and pattern, but do not possess obnoxious qualities.

butterflies are colored after the manner of the plants on which they are deposited.

Innumerable caterpillars possess the form and coloration of their environment. Those which feed on grasses are almost invariably long, cylindrical and green. The larva of the California Sister, *(Heterochroa californica)*, is a perfect match for the oak leaf. Most of the Lycaenid caterpillars are practically invisible in their natural surroundings, as witness the larva of the Juniper Hair-streak, *(Mitoura siva juniperaria)*. See Figure A52a.

Many Geometrid caterpillars, of the measuring-worm type, are shaped and colored in the semblance of twigs, and the camouflage is further strengthened by the attitude they assume. *Phasiana curvata* admirably illustrates this, as will be noted in Figure A52b.

Butterfly chrysalids commonly resemble leaves, twigs, bark or stone.

Some animals and insects have the power of modifying their color in response to a change of environment. A familiar example of this type is the chameleon.

It has been frequently observed that the caterpillar of the Cloudless Sulphur, *(Catopsilia eubule)*, assumes a yellow tint when feeding on the blossoms of *Cassia*, whereas it is green when found on the leaves.

A large number of butterflies resemble leaves, the most familiar example being the Leaf Butterfly of India, *(Kallima inachis)*. See Plate B fig. 2.

The Angle-wings, *(Polygonia)* are exactly the color of bark on the under surfaces of their wings. It is a common habit for them to rest on the trunk of a tree, with their wings closed.

Another type of protective adaptation consists in certain unpleasant or noxious qualities, such as that possessed by the familiar skunk.

A few caterpillars, notably the *Papilios*, have protrusive organs which emit an offensive substance.

All of the Danaid butterflies are believed to be obnoxious to insectivores. Moths of the genus *Zygaena* possess acrid or offensive qualities, and the same holds true for many other groups.

Another interesting mechanism of survival, consists in the acquisition by non-protected species of the colors and patterns of obnoxious forms.

A good example of this is the case of *Basilarchia obsoleta,* which imitates *Danaus berenice* (Plate 46, figs. 1 to 3). The Basilarchias do not possess repellant qualities, and they would therefore admirably serve the palate of insectivorous birds and mammals. With the close resemblance of the two species, it is readily seen that confusion would arise, in consequence of which both would be shunned.

This imitative principle is widespread among the butterflies, and is termed "protective mimicry."

Dr. A. Seitz, in writing of the phenomena states that "there are many localities in South America, often quite circumscribed in extent, in which almost all the lepidopterous species that occur in any numbers have one and the same wing-pattern indifferently, whether they be butterflies or moths, whether stoutly-built Swallowtails or weak Pierids or shy Nymphalids.

In Columbia one may see flying about a single flowering shrub a number of butterflies, all colored and marked alike, but belonging to four entirely different groups. They are all black, with an oblique scarlet band on the forewings. The first is a Pierid *(Pereute leucodrosyne)*, the second a Heliconid *(Heliconius melpomene)*, the third a Swallowtail *(Papilio euterpinus)*, and the fourth *(Adelpha isis)* a species of Nymphalid allied to Limenitis. In certain districts of Southern Brazil a yellow band on the forewing and dentated longitudinal stripes on a brownish yellow ground provide the general scheme, which is followed by Pierids *(Perhybris, Dismorphia)*, Danaids *(Lycorea)*, Heliconius *(Heliconius narcaea)* and even some moths *(Chetone)*."

Still another type of mimicry exists, in which an insect assumes the form of some totally unrelated species or form. Many Syrphid flies resemble bees, although they are without stings. A number of Sesiid moths simulate wasps.

The giant Brassolids of South America, known as Owl Butterflies, bear a remarkable resemblance to the heads of owls. (See Plate B, fig. 1). They fly in the evening, and the great eyelike spots may have a protective significance.

It must not be assumed that the many striking protective patterns of butterflies have been acquired as a matter of conscious choice on the part of these insects. They represent the end product of a long series of gradual changes, operating in accordance with the great laws of Adaptation, and along lines of continual betterment.

## Family Satyridae

# THE SATYRS and ALLIES

IN the temperate zone of the Old World, this family reaches a remarkable degree of development, in strong contrast to their poor representation in North America. They are butterflies of medium size, and dull coloration, although a number of South American forms have taken on brighter hues.

In the Americas they are distributed from the far northern arctic regions to the extreme southern tip of Tierra del Fuego.

A few of our North American species are mountain dwellers, where they occur in exposed and forbidding environments. Some of the genera, which are composed of smaller species, have weak powers of flight, and are partial to grassy areas.

A large number are characterized by eye-like spots, or ocelli, on the under surfaces. Several of the tropical forms fly at dusk, and very few of the group are partial to strong sunlight.

## THE RINGLETS. Genus COENONYMPHA Hbn.

THE CALIFORNIA RINGLET *(Coenonympha california* West. & Hew.) is an exceedingly common butterfly in the state from which it takes its name. In the early days of spring it flies over the grassy foothills of the coastal slope in countless thousands, yet, with its sombre colors and retiring demeanor, is seldom noticed, save by the observing.

The California Ringlet represents the spring form of a species which is seasonally dimorphic, as may be noticed by comparing the white examples of the first brood with the yellow form of the same insect found in the later months. The latter is subsequently dealt with.

*California* is distinguished from its nearest relatives by the presence of numerous ocelli on the under side of secondaries, the slaty-gray shading, and, on the upper side, the white scaling. This delicate wraith is found in all parts of the state, except in the far northeastern sections, and possibly also the higher alpine regions, and desert wastes. The prime requisite for its existence is the presence of grasses.

EARLY STAGES. These are admirably presented in Edwards' work.

Egg. Shown in Figure A27a. Edwards' illustration failed to note the button-like projection in the region of the micropyle, a feature that was present in all of the examples so far observed. The color when first laid is yellow, changing later to greenish-ivory flecked and streaked with brown.

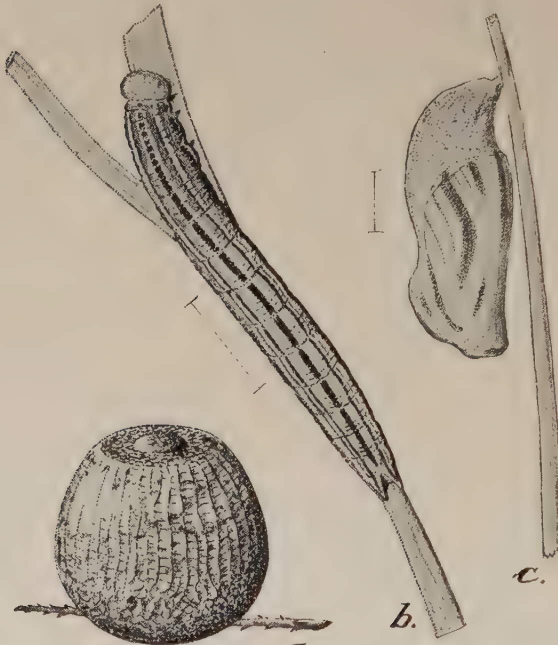


FIGURE A27
EARLY STAGES OF *Coenonympha california*
a. EGG, GREATLY MAGNIFIED. b. CATERPILLAR, MUCH ENLARGED.. c. CHRYSALIS, MUCH ENLARGED

Caterpillar. Resembles very closely the grasses on which it feeds, both in its long cylindrical form and the shades of brown or olive in its coloring. The illustration obviates the need of a description. See Figure A27b.

Chrysalis. Shown with the caterpillar, in the figure above referred to. The color is a delicate translucent brown or green.

Larval food-plant. Grasses.

ILLUSTRATED. Plate 18. ♂ fig. 4; ♂ under side fig. 5; ♂ dwarf, fig. 6.

BOISDUVAL'S RINGLET *(Coenonympha california galactinus* Bdv.) represents the summer and autumn phase of the species previously treated. It is distinguished by the creamy-yellow color on the superior surfaces of wings and the brownish-yellow shadings on under side. As with *california*, the number of eye-spots on the secondaries is exceedingly variable.

This form is not as common as the typical, although its season is much longer.

Henry Edwards described an aberration *(pulla)* which is characterized by dark fawn color above and dull brown beneath.

Illustrated. Plate 18. ♂ fig. 2; ♂ under side fig. 3; ♀ fig. 1.

THE NORTHERN CALIFORNIA RINGLET *(Coenonympha california eryngii* Hy. Edw.) is a geographic race of the California Ringlet which occurs in the mountainous districts adjacent to Shasta, and thence north to the Oregon border. It is very similar to *C. california galactinus*, and differs only in the absence of ocelli on the under side of secondaries.

Although comparatively common in its restricted locality, it is still rare in collections.

*Eryngii* represents the generations which follow the early spring brood, as is the case with *galactinus*. There is therefore an earlier white form corresponding to typical *california*, which the author has recently named *siskiyouensis*. This is treated below.

Illustrated. Plate 18. ♂ under side fig. 13; ♀ fig. 14.

THE SISKIYOU RINGLET *(Coenonympha california siskiyouensis* Comst.) is, as above stated, the first generation of this dimorphic butterfly, resulting from emergence of overwintering chrysalids. Its range is noted above. At present it is exceedingly rare in collections, but undoubtedly flies in abundance on its native heath at the right season of the year, which is in advance of the time when collectors are usually in the field.

Illustrated. Plate 18. ♂ (holotype) fig. 11; ♂ under side fig. 12.

THE AMPELOS RINGLET *(Coenonympha ampelos* Edw.) is taken on the high plateaus of northeastern California, and portions of the Mono Basin, ranging from thence north and east.

It may be distinguished from other nearly related forms by the total lack of ocelli on all wings, and the rich yellow coloration, together with the characteristic markings on the under side.

*Ampelos* is an uncommon capture in California, but is more plentiful in some of the states to the north. Vancouver Island specimens are considerably darker than those taken within our borders.

EARLY STAGES. These were described by W. H. Edwards in the "Canadian Entomologist," Vol. XIX, p. 41.

Egg. Very similar to that of *california,* but with fewer ribs.

Caterpillar and chrysalis. Differ very little from the equivalent stages in the California Ringlet except in certain points of color, as indicated by Edwards. Figure A27 will therefore serve for both species.

Larval food-plant. Grasses.

ILLUSTRATED. Plate 18. ♂ under side fig. 9; ♀ fig. 10.

THE ELKO RINGLET *(Coenonympha ampelos elko* Edw.) is a lighter form of the above species, occurring in northeastern California, Nevada, and certain states to the north. The characteristic feature of this variety is a light area on the outer third of the under side of secondaries. Intergrades occur between *elko* and *ampelos* which are impossible to place, and serve to demonstrate that we are dealing with a single variable species.

EARLY STAGES. Undoubtedly the same as for typical *ampelos,* and hence fully described by Edwards.

ILLUSTRATED. Plate 18. ♂ fig. 7; ♀ under side fig. 8.

## THE SATYRS. Genus NEOMINOIS Scud.

RIDING'S SATYR *(Neominois ridingsii* Edw.) has not heretofore been recorded for our state. Its stronghold is in the Rocky Mountains, but recent entomological explorations on the higher sierran peaks have revealed it at isolated points. One of these colonies was discovered on the range to the south of the Mammoth Lakes, in Mono County. There, in an environment of rocky summit and wind blown crag, was found this strange waif of the mountains, in company with the Ivallda Arctic. Its color, when at rest, is exactly that of the moss-grown rock, so that one sees it only in moments of flight. Upon alighting, it frequently bends over on its side, thus making itself even less noticeable.

*Ridingsii* is a great rarity in California, but is not uncommon in Colorado. It is on the wing only in mid-summer.

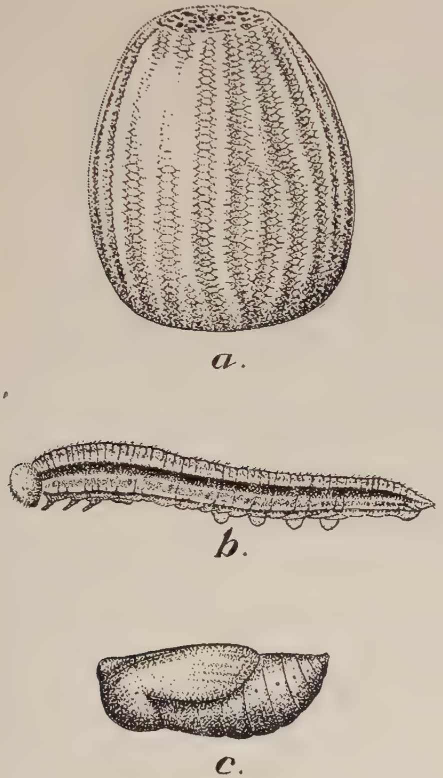


FIGURE A28
EARLY STAGES OF *Neominois ridingsii*
a. EGG, GREATLY MAGNIFIED. b. CATERPILLAR, ENLARGED. c. CHRYSALIS, ENLARGED

EARLY STAGES. These are illustrated and recorded in Edwards' third volume.

Egg. Color, chalky white; shape sufficiently defined in Figure A28a.

Caterpillar. When mature, reddish-buff, with pale green sides, and a mid-dorsal blackish stripe. It is thickly covered with minute pointed tubercles of irregular sizes, each bearing a clubbed and appressed whitish process. See Figure A28 for both larva and pupa.

Chrysalis. Predominantly red-brown, darkest anteriorly. The divisions of abdomen are green, as are also the wing-cases. Pupation takes place under the ground.

Larval food-plant. Grasses.

ILLUSTRATED. Plate 18. ♂ fig. 15; ♀ fig. 16; ♂ under side fig. 18; ♀ under side fig. 17.

## THE SATYRS or WOOD NYMPHS. Genus CERCYONIS Scud.

THE BOOPIS SATYR *(Cercyonis alope boopis* Behr.) frequents the grassy hillsides and marshes of the central to northern counties, appearing in June, and flying through August. It has been observed in great abundance on the open hills above Mill Valley, north of the San Francisco Bay. Only one brood is produced in a season. *Boopis* represents a race of *C. alope,* an eastern species, which has developed a large number of geographic races and forms, of which three are listed for California. The characteristic feature of this Satyr is its tendency toward obsolescence of the ocelli on the under side of secondaries, and the lighter shade of gray on the upper surface, particularly of the female.

EARLY STAGES. These have not been recorded for any of the forms of *alope* occurring in our state, but they are undoubtedly very similar to those of *C. alope nephele,* a northern dark race. Edwards has recorded the metamorphosis of the latter in Vols. 9 and 12 of the "Canadian Entomologist," and also (with illustrations) in his historic work on the "Butterflies of North America."

Larval food-plant. Grasses.

ILLUSTRATED. Plate 19. ♂ fig. 1; ♀ fig. 2; ♀ under side fig. 3.

BARON'S SATYR *(Cercyonis alope boopis* form *baroni* Edw.) is a small dark form occurring in the extreme northeastern portions of California, and ranging north into Oregon. It frequents marshy lands, and flies in late summer. The comparative isolation of the territory in which it is found makes it a rarity in collections. As with all of our Satyrids, it is single brooded.

*Baroni* usually bears eye-spots (ocelli) on the under side of secondaries, but they are small and inconspicuous.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 19. ♂ fig. 4; ♂ under side fig. 5; ♀ fig. 6.

THE HOARY SATYR *(Cercyonis alope boopis,* form *incana* Edw.) is a dark form, averaging slightly smaller than *boopis,* and bearing well defined ocelli on the under side of secondaries. It seems much less common in this state than typical *boopis,* but is probably more abundant in Oregon and Washington. There are no records of its occurrence south of the Sacramento watershed. The Hoary Satyr frequents woodsy areas, and dry territories, in contrast to the two forms previously described, which seem to prefer marshes or hillsides, where the grass is lush.

Early Stages. Unknown.

Illustrated. Plate 18. ♂ fig. 19; ♂ under side fig. 20; ♀ fig. 21.

THE ARIANE SATYR *(Cercyonis ariane* Bdv.) is distinguished from other members of the genus by the clear cut striations on the under surface, and the series of six spots on each secondary, disposed in groups of three. The center spot in each one of these groups is large, and always clearly defined. The females are lighter than the males, and show more yellow around the spots on upper side of primaries.

This handsome Satyr occurs in the far northeastern corner of California, and extends over the borders, northward into Oregon, and eastward through Nevada into Utah. It is only found in marshy situations, where there is an abundance of grass. Only one brood is produced in a year, the flight being at its best in the latter part of July and early August.

Early Stages. Unknown, but undoubtedly similar to those of *alope.*

Illustrated. Plate 19. ♂ fig. 10; ♂ under side fig. 12; ♀ fig. 8; ♀ under side fig. 9.

STEPHEN'S SATYR *(Cercyonis ariane* ♀ form *stephensi* Wright) is a large yellow-bordered form of the female of *C. ariane.* It was long thought to be a distinct species, but investigations carried on in the type locality (see Bulletin Southern California Academy of Sciences, Vol. 23, No. 1, 1924) have helped to fix its status.

Only an occasional example will show the extreme extent of this yellow banding. A long series will give every gradation between the dark female of *ariane* and the typical *stephensi.*

Stephen's Satyr is a great rarity, not only because of the isolation of the country in which it is found, but also on account of its infrequent occurrence.

Illustrated. Plate 19. ♀ fig. 7.

WHEELER'S SATYR *(Cercyonis ariane wheeleri* Edw.) is a form of *C. ariane* in which the anterior eye spot on the primaries is paired, and the second spot from costal margin on under side of secondaries is elongated. The figures which we have reproduced from the plates in the Wheeler Survey are probably not accurate, as they show too light a ground color on under side, and too much contrast in shade and line on the upper side.

This butterfly was taken by the naturalists of the Wheeler Expedition in 1871. The exact location from whence the types came is unknown. One report places it near Owens Lake, another at Apache, Arizona, and a third "somewhere east of the Cascades." In all events, no other examples have been found since the original discovery. Either the form is now extinct, or else it is extremely local, and has escaped the attention of collectors.

Nothing is known of its habits, or metamorphosis.

ILLUSTRATED. Plate 21. ♂ fig. 1; ♀ fig. 2; Plate 19. ♀ under side fig. 11.

BEHR'S SATYR *(Cercyonis behrii* Grinnell) is a species which was originally described from material collected many years ago in the region of Mt. Tamalpais, north of San Francisco Bay. The types were in the Behr collection of the Academy of Sciences, and were destroyed in the San Francisco fire. The writer has collected many times in the supposed type locality, and has been in correspondence with lepidopterists familiar with the Tamalpais area, in hopes of securing examples that would correspond with Grinnell's description, but the quest has thus far been fruitless. No specimens are available for illustration.

To aid collectors in their search for this "lost" species, the following extract and analysis is given from the author's original description:

Readily distinguished from any other Satyrid by its smaller size, darker color, and very distinct markings. ♂. Primaries have two ocelli placed in the usual position, the upper one larger, with a distinct white central dot, and surrounded by a ring of lighter color. The lower ocellus is a single black spot without white center. Secondaries have a single ocellus, posteriorly placed, small, and without a white center. Under side crossed by many dark irrorations;

submarginal to the two ocelli is a wavy distinct brown band formed into crescents toward the inner margin; the upper of the two ocelli is like the one on the upper side, the lower is exactly like it only somewhat smaller. Between the ocelli and the margin is a comparatively broad dark brown band. Secondaries more mottled with grayish than the primaries; a very broad fascia in the center of the wing, extending from costa to base parallel to outer margin. The usual row of six ocelli occurs as in many other species, arranged in groups of threes, with the center ocellus of each group largest. Between these and outer margin is a brown band corresponding to that of the primaries.

♀ resembles the male in all particulars except that the ocelli on primaries are large and of equal size; the one ocellus on secondaries is larger and bears a white central dot.

It is not unlikely that this species, like the one following, has now become extinct.

BOISDUVAL'S SATYR *(Cercyonis sthenele* Bdv.) may be counted the rarest of all North American butterflies, as it has been extinct for many years.

It formerly occurred in the San Francisco district, flying over the sand-hills in fair abundance. These hills have now given place to a great city, and in the process of their development this exquisite little Satyr has gone the way of many another wild thing.

The largest known series of this species was in the Academy of Sciences Museum at San Francisco, and helped to feed the smoke of that historic conflagration of 1906.

The figures are taken from Dr. Oberthur's excellent reproduction of Boisduval's types, the right hand portion of each drawing representing the upper side, and the left showing the reverse.

Nothing has been recorded of the early stages.

Illustrated. Plate 20. ♂ fig. 2; ♀ fig. 3.

THE SYLVAN SATYR *(Cercyonis silvestris* Edw.) is widely distributed throughout California, and is the dominant species in the southern portion of the state.

The characteristic feature of *sylvestris* is a tendency toward complete suppression of ocelli on both surfaces of the secondaries, and a uniform mottling of the under side. There is great variation in this respect, however, as will be noted by reference to the several examples shown on the colored plate. A long series from different localities will show a gradation toward the form *paulus*, in which well marked ocelli are the special feature.

The Sylvan Satyr frequents grassy oak-grown slopes and hot semi-desert areas, as do most of the small western *Cercyonids*. It is on the wing from June to August. It is probably less common than in former times on account of the settlement and gradual clearing of the grassy lowlands resulting from the great influx of settlers into southern California.

The butterfly has an erratic, bouncing sort of flight, which makes it somewhat difficult to capture.

Early Stages. Undescribed, but probably somewhat similar to those of *C. oetus*.

Illustrated. Plate 20. ♂ fig. 1; ♂ under side fig. 8; ♀ fig. 5; ♀ under side figs. 4, 6 and 7.

THE LITTLE SATYR *(Cercyonis silvestris paulus* Edw.) is a race of the preceding species which is characterized by a series of prominent ocelli on the under side of secondaries, and a large amount of white scaling on the outer third of the same portion of wing. The striations on under surface are in strong contrast to the ground color. On the upper side of secondaries there is usually a single ocellus near the anal angle.

This form varies toward typical *sylvestris*, and those examples which are intermediate in character will be found difficult to classify.

The Little Satyr is the dominant form in the Mono Basin, and occurs sparingly through the northeastern portions of the state. Its season is from mid-summer to August. It was observed in great numbers at Topaz Lake, on the boundary between California and Nevada, where it was feeding on a species of *Melilotus*. In cultivated areas it shows great fondness for the blossoms of alfalfa.

Early Stages. Undescribed, but undoubtedly similar to those of *sylvestris*.

Illustrated. Plate 20. ♂ fig. 9; ♀ fig. 10; ♀ under side figs. 11 and 12.

THE LEAST SATYR *(Cercyonis oetus* Bdv.) is not as common in this state as it is in the Rocky Mountain regions. It occurs in the mountainous districts of northern to central California at high elevations. In the Sierras, and on the lava beds of the northeastern counties it is the dominant Satyr. As with others of the group, it is single brooded, and flies from late June to August.

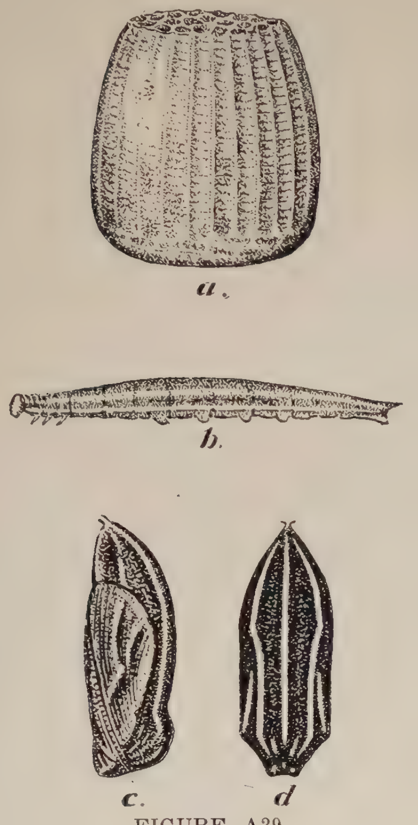


FIGURE A29
Early Stages of *Cercyonis oetus* (Redrawn from Edwards')
a. Egg, Greatly Magnified.
b. Caterpillar, Enlarged.
c. Chrysalis, Lateral View Enlarged.
d. Chrysalis, Dorsal View, Enlarged

The characterizing feature of this species is a tendency toward the restricting of the ocelli on upper side to a single spot in the anterior portion of primaries, and the dark ground color of the under side of secondaries, which are streaked with numerous transverse black striations.

Early Stages. These were described by W. H. Edwards in the "Canadian Entomologist," Vol. 18, p. 88, and were also treated at length in the third volume of his "Butterflies of North America."

Egg. Shown in Figure A29a. Color, lemon yellow.

Caterpillar. When mature, various shades of green, the tails tinged with red.

Chrysalis. Extremely variable in color, some examples being a delicate light green, without appreciable markings, others a black with darker markings as shown in the figure; still others showing various gradations between these two extremes. Figures A29 and A30 show this stage, and also that of the caterpillar.

Larval food-plant. Grasses.

ILLUSTRATED. Plate 20. ♂ fig. 13; ♀ fig. 14; ♂ under side fig. 15; ♀ under side fig. 16.

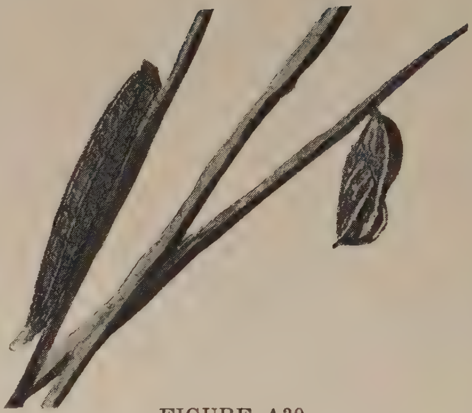


FIGURE A30
CATERPILLAR AND CHRYSALIS OF
*Cercyonis oetus*

### THE ARCTICS. Genus OENEIS Hbn.

THE GREAT ARCTIC *(Oeneis nevadensis* F. & F.) is an inhabitant of the northern counties of the state, particularly in what is known as the Hudsonian and Canadian Zones, and ranges from thence into British Columbia on the north, and east into Nevada. It is a forest dweller, delighting in little open glades where spots of sunlight filter through the leafy canopy, in which it sports with a nervous jerky flight.

While resting it usually chooses a bit of bark or dead limb, which gives admirable protection on account of the mottled wood-brown color of its under surfaces. W. S. Wright records it also in "the grassy foothills where the pine and oak are scattered scantily about."

June and July are its favored months of flight. It is never abundant.

Edwards has distinguished a form *(iduna)* which differs principally in the lighter color, more pointed primaries, less scalloped discal band on under side of secondaries, and the ocelli on upper

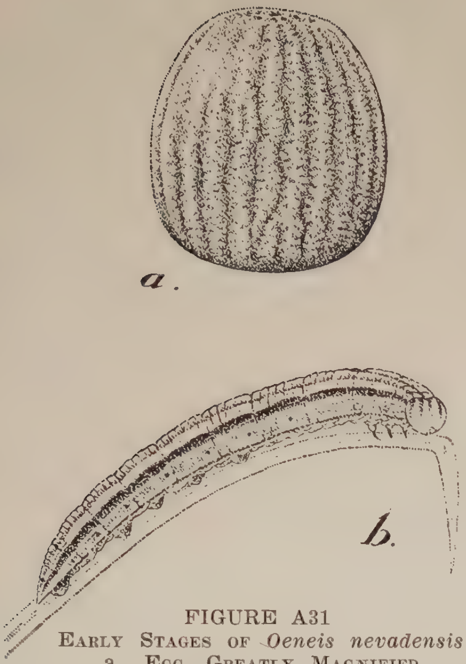


FIGURE A31
Early Stages of *Oeneis nevadensis*
a. Egg, Greatly Magnified
b. Caterpillar, Enlarged

side of primaries in the female arranged in a straight line.

Early Stages. These have been in part described by Edwards in his third volume.

Egg. Illustrated in Figure A31. Color, gray-white.

Caterpillar. Shown in the figure above referred to. In color it is a brownish-buff with a black mid-dorsal stripe, and a number of additional bands varying from whitish, through shades of brown to black.

Chrysalis. Unknown.

Larval food-plant. Grasses.

Illustrated. Plate 21. ♂ fig. 3; ♀ fig. 4; ♂ under side fig. 5.

THE IVALLDA ARCTIC *(Oeneis ivallda* Mead) is a child of the cloudlands, having its abode on the pinnacles of the Sierras. No rocky outcropping seems too high or bleak for it—no cliff too precipitous for its hasty retreat if once the collector misses the rare opportunity of a first "shot." The gray mottling of *ivallda's* under surface is a perfect camouflage when it is at rest on some lichen-covered rock or mottled bit of granite. One must note carefully the exact spot of alighting, and stalk the resting butterfly with sharp eyes, cat-like stealth and a quick downward stroke, to affect a capture.

The Ivallda Arctic must be sought in mid-summer. Its season is short, as is the case with all alpine species. There is no sport more rare than a climb to dizzy heights for this choice and wary butterfly.

Early Stages. All that we know of these was recorded by Edwards in his second volume, where the egg and young larva are figured. The mature larva and chrysalis are unknown. See Figure A79, p. 259.

Larval food-plant. Grasses.

Illustrated. Plate 21. ♂ figs. 6 and 7; ♀ figs. 8 and 9; ♀ under side fig. 10.

## Family Nymphalidae

## THE BRUSH-FOOTED BUTTERFLIES

THIS great family is the largest, and most widely distributed of all the divisions of the Rhopalocera.

It is composed of medium sized to large butterflies, some of the tropical groups attaining gargantuan proportions.

In California this family furnishes the greater number of our characteristic butterflies, on account of the remarkable elaboration of the Fritillaries, and Checker-spots. It is subdivided into two groups, or subfamilies; the Heliconiinæ, and Nymphalinæ. The former is represented in the state by only a single Genus, but is developed to remarkable proportions in the tropics.

The Nymphalinæ are characteristically powerful of wing, and prefer the mid-day hours. In comparison with the Danaids, they are relatively short lived, although in such genera as Vanessa, the habit of hibernating over the winter extends their span of life.

### The Heliconians. Subfamily Heliconiinae

### THE SILVER-SPOTS or FRITILLARIES. Genus DIONE Hbn.

THE GULF FRITILLARY *(Dione vanillæ* L.) is an exceedingly common insect in Southern California, particularly in and about the towns and cities located south of the Tehachapi. This is due to the fact that its food-plant is widely used as an ornamental vine. It breeds continuously throughout practically the entire year, but is more plentiful in August and September.

W. G. Wright states that it was introduced with the advent of the Southern Pacific Railroad, from the Gulf States, but Karl Coolidge has questioned this on good authority. (See "Entomological News," Vol. 35, p. 22.)

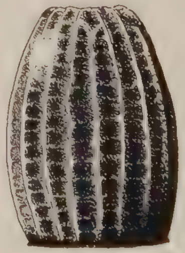


FIGURE A32
Egg of *Dione vanillæ*
Greatly Magnified

The Gulf Fritillary is uncommon north of Santa Barbara.

Mr. Jean Gunder has recently named an aberration of this butterfly, which is illustrated in the "Entomological News," Vol. 36, Plate 1. It bears the title *comstocki*, and is characterized principally by a large amount of black suffusion on the outer half of secondaries, a blurring and spreading of the black veining on the marginal portion of primaries and a heavy shading in the costal area of the same.*

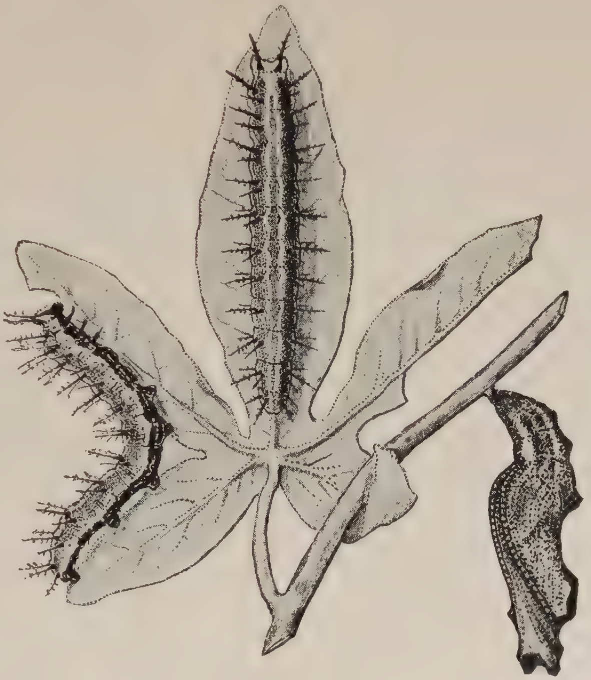


FIGURE A33

Caterpillar of *Dione vanillæ* Feeding on Leaf of *Passiflora*, and Chrysalis, Suspended from Stem

(The Passion-vine leaf is shown in a turned-up position in order to demonstrate the veining

Early Stages. Egg. Pictured in Figure A32. It bears from eighteen to twenty longitudinal ribs, and fine transverse striations. The color is yellow, changing to a reddish hue shortly before hatching.

Caterpillar. Shown, together with the chrysalis, in Figure A33. Color, slaty gray with burnt-orange stripes. The spines are black, as are also the legs.

Chrysalis. Mottled whitish gray, brown and black. See Plate 63, fig. 8.

Larval food-plant. Various species of *Passiflora*.

Illustrated. Plate 22. ♂ figs. 2 and 3; ♂ under side fig. 1; ♂ aberrant form fig. 5.

---

*The following note appears in Barnes and Benjamin's corrections to the List of Diurnal Lepidoptera, published in the "Bulletin So. Calif. Academy of Sciences," Vol. 25, part 3, 1926:

Gunder described *comstocki* as an ab. of *vanillae*. If names described as "abs." are available specifically and sub-specifically, and in general they have been so held in the past, then the name *comstocki* applies to the subspecies from Boreal America with the name *incarnata* applicable to the normal form of the same sub-species."

## Subfamily Nymphalinae

### THE FRITILLARIES. Genus EUPTOIETA Dbldy.

THE VARIEGATED FRITILLARY *(Euptoieta claudia* Cram.) is occasionally, though rarely, observed in southern California, and one collector has recorded it as far north as Mono County.

It seems strange that *claudia* should have difficulty in becoming established in this state, in view of the prevalence of its various food-plants.

In the region of the Gulf this butterfly produces several broods annually.

Early Stages. These have been frequently recorded, and are given in sufficient detail for all practical purposes in Holland's "Butterfly Book."

Egg. Conoidal, relatively taller than the eggs of *Argynnis,* which otherwise closely resemble it. Color, pale green.

Caterpillar. Of the characteristic "spiny" type. The predominating color is reddish yellow, with two brown lateral bands, and a series of white spots upon the back. The spines, of which there are six rows, are black, as is also the head.

Chrysalis. Pearly white, marked with black spots and longitudinal streaks.

Larval food-plants. Violet, pansy, mandrake, *Passiflora, Portulaca, Desmodium* and *Sedum.*

Illustrated. Plate 22. ♂ fig. 4; ♂ under side fig. 6; ♂ dwarf fig. 10.

THE MEXICAN FRITILLARY *(Euptoieta hegesia* Cram.) has been included by several writers as a California species, but it is doubtful if it has ever been taken on the west coast north of the Mexican line. It is included in the colored plate in the hope that it may some day drift over the border and be captured by some lucky and discriminating entomologist. The picture will serve to differentiate it from *claudia.*

Illustrated. Plate 22. ♂ fig. 7; ♂ under side fig. 8; ♀ fig. 9.

## Genus ARGYNNIS Fabr.

## (DRYAS Hbn.)

THE APACHE FRITILLARY *(Argynnis apacheana* Skin.) is one of the prizes, both in point of beauty and rarity. It occurs in a restricted area of California, east of the Sierras, extending from Mono Lake to Round Valley, Inyo County. It is also found at isolated points in Nevada.

If one is fortunate enough to be on hand in a favored season, during the latter part of August, and weather conditions are of the best, it may be netted in fair abundance. Particularly is this true if a field of the California thistle *(Carduus californicus)* is found in bloom, in its line of flight. The butterflies become absorbed in their nectar sipping, and may be easily netted. Without this combination of circumstances, *apacheana* is a difficult insect to capture. It will always be rare in collections on account of the inaccessible country in which it is found.

Early Stages. Nothing is known of these. This statement holds true for nearly all of the members of this genus. There is a rich field here for investigation, which it is hoped will be cultivated by the younger generation of western entomologists.

The larvæ of all the Argynnids feed on violets, and are nocturnal in habits.

Illustrated. Plate 23. ♂ fig. 2; ♀ fig. 1; ♂ under side fig. 3.

THE ABERRANT APACHE *(Argynnis apacheana* ab. *hermosa* Comst.) is a beautiful and unique aberration of the forementioned species, which the author was fortunate enough to secure in Round Valley, Inyo County, while on a camping and collecting trip in this fascinating region. There is a thrill in the capture of such a rarity as this, which far transcends the exhilaration of the big game hunter over his kill, for with it there is no lingering regret over the death struggle of a highly organized and sentient thing.

Illustrated. Plate 23. ♂ fig. 4.

THE LETO FRITILLARY *(Argynnis leto* Behr.) is another handsome member of this involved genus, occurring in the Sierras, and the mountain ranges to the north, as far as the Oregon line, and beyond. It emerges in July and continues its flight into August.

*Leto* favors moderate elevations, preferring districts of heavy timber. In the Yosemite Valley, and on the lower slopes of Shasta, it is abundant in certain seasons.

Early Stages. Unknown.

Illustrated. Plate 23. ♂ fig. 5; ♀ fig. 6; ♂ under side fig. 7.

THE LESSER LETO *(Argynnis leto* ab. *letis* Wright) is a variant of the above species in which the black markings on the outer third of wings are much reduced. It is a rarity.

Illustrated. Plate 23. ♂ fig. 8.

THE CHITONE FRITILLARY *(Argynnis chitone* Edw.) is abundant in Utah. It reaches California only in the extreme northeastern section, where it is decidedly rare. It belongs to a section of the genus in which the species so closely resemble one another that it is difficult to arrive at a classification. Only by a careful analysis of the spots and markings of both upper and under sides can this be accomplished. *Chitone* is a silvered form, with a dull fulvous ground color on the upper side, and light ferruginous below. The silver spots are relatively small, and one of the characteristic features is the wide yellowish-fulvous area between the marginal spots on secondaries, and the submarginal row. This light color is continued in broken patches clear to the basal area. It is also present over practically all of the under side of primaries.

Early Stages. Entirely unknown.

Illustrated. Plate 24. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

THE HIPPOLYTA FRITILLARY *(Argynnis bremneri hippolyta* Edw.) is a rare form of Bremner's Fritillary which is occasionally encountered in the northern tier of counties in July. It is a boldly marked butterfly, the black spots and streaks of the superior surface being well defined. The silvering is conspicuous. The submarginal buff band of secondaries is narrow, and internal to this the ground color is a deep ferruginous, with a few spots of buff superimposed on it, and the silver spots showing in bold relief. *Hippolyta* is represented in few collections.

Early Stages. Unknown.

Illustrated. Plate 26. ♂ fig. 7; ♀ under side fig. 8; Plate 24. ♂ under side fig. 5.

COTTLE'S FRITILLARY *(Argynnis cottlei* Comst.) is a species occurring in Modoc County, the type being taken in the mountains north of Alturas. Although it is treated here as a separate species, there is strong probability that it is an unsilvered form of *hippolyta.* The upper surface is practically the same as the last named species, being boldly marked in heavy black lines and dots. The under surface is accurately pictured in the plate, and is very similar to *hippolyta* except that the spots are buff instead of silver, and are relatively large. At present this type is a unique, but undoubtedly other examples will be found by diligent collecting in the northeastern portion of California.

The species is named for Mr. James E. Cottle, of San Francisco, who secured this rarity on one of his field excursions.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 26. ♀ under surface fig. 2.

BEHREN'S FRITILLARY *(Argynnis behrensii* Edw.) is another rare species occurring in Mendocino County, and probably also in other portions of northern California, since the same species is recorded from Utah, and should therefore be found in the intervening territory.

This butterfly is characterized by a heavy shading in the basal areas of both primaries and secondaries, on the upper side. Below it is well silvered, the secondaries being a dark brown, except for the buff band, which is usually rather narrow.

*Behrensii* is on the wing from June to August, with July as the favored month.

EARLY STAGES. Not yet ascertained.

ILLUSTRATED. Plate 24. ♂ fig. 4; ♀ fig. 6; ♂ under side fig. 7.

THE ZERENE FRITILLARY *(Argynnis zerene* Bdv.) is a widely distributed butterfly in the state, occurring in the Sierras from approximately Madera County to the northern border. It is a denizen of forested lands, and does not ascend to the alpine zone. In the flower-spangled meadows of the timbered uplands, particularly on the western slopes of the ranges, it is at times abundant. June and July are its favored months of flight.

*Zerene* is a large species, with wide black dashes on the upper side of primaries. On the under side, the fore-wings are of a reddish tint on the posterior portion, the apices being brownish, and a buff area occurring internal to this. The secondaries are heavily shaded with grayish brown. The marginal spots are usually silvered; the others may be, but are frequently buff. The female always shows more tendency toward the silvering.

Early Stages. As yet undetermined.

Illustrated. Plate 24. ♂ fig. 8; ♂ under side fig. 9; ♀ fig. 10.

THE ROYAL FRITILLARY *(Argynnis zerene conchyliatus* Comst.) is a dark form of the above species, occurring in the northern tier of counties. It is characterized by the greater amount of deep purplish brown on the under side of secondaries, a feature that is especially marked in the female. Both sexes are well silvered.

Illustrated. Plate 25. ♂ under side fig. 1; ♀ under side fig. 2.

THE SHASTA FRITILLARY *(Argynnis zerene* ab. *shastaensis* Comst.) is a striking aberration of the Zerene Fritillary, which was taken by Mr. James E. Cottle, in the vicinity of Mount Shasta. The upper surface of this handsome "freak" is accurately pictured on the colored plate. The inferior surface, which is described in detail in the "Bulletin, Southern California Academy of Sciences," Vol. XXIV, Part 3, Sept., 1925, shows it to be a variant of *zerene* or *conchyliatus*, and not of *hydaspe*, as listed by Drs. Barnes and Benjamin. The type is a unique, but diligent collecting in the Shasta region should result in others being taken.

Illustrated. Plate 26. ♂ fig. 1.

THE HYDASPE FRITILLARY *(Argynnis hydaspe* Bdv.) is found in practically the same environment as *zerene*, and the range of the two species within California is very similar. *Hydaspe*, however, extends farther north, assuming a darker color and smaller size, which finds its extreme expression in the British Columbian race *rhodope*. It also comes farther south, assuming a lighter shade in response to a warmer and drier environment, culminating in the race *viridicornis*. In the Yosemite region *zerene* and *hydaspe* fly in company, reaching the period of their greatest abundance in July. Superficially they resemble each other, but in *hydaspe* the spots on the under surface are never silvered, and are proportionately larger.

Early Stages. Entirely unknown.

Illustrated. Plate 25. ♂ under side fig. 6; ♀ fig. 7; ♀ under side fig. 8.

THE PURPLE FRITILLARY *(Argynnis hydaspe purpurascens* Hy. Edw.) is an intermediate form between typical *hydaspe* and the far northern race *rhodope*. The colored figures accurately picture the characteristic features of this dark race, such as the rich purplish-brown ground color of the under side of secondaries, and the heavy wide bands of primaries.

*Purpurascens* occurs in the northern tier of counties. It is at times abundant in the upper Sacramento Valley, where it is on the wing in late June and July.

Illustrated. Plate 25. ♂ fig. 10; ♂ under side fig. 9; ♀ under side fig. 11.

THE GREENHORN FRITILLARY *(Argynnis hydaspe viridicornis* Comst.) is, as previously stated, a southern race of *hydaspe*. This interesting form was brought to the author's attention by Mr. W. H. Ireland, and was named for the Greenhorn Mountains, where the types were found. It differs from typical *hydaspe* principally in the larger amount of buff on the under surface of wings, particularly on the secondaries. This lighter shading is almost as marked as in *Argynnis irene*. This similarity has caused Dr. Benjamin to list it as a synonym of the last named species. A careful analysis will, however, show its close relationship to *hydaspe*, as all of the characteristic markings of that species are present, such as the heavy spots and bands of the superior surface, and the rich reddish-brown of the posterior portion of under side of primaries.

Illustrated. Plate 25. ♂ fig. 4; ♂ under side fig. 3; ♀ under side fig. 5.

THE DARK FRITILLARY *(Argynnis hydaspe* ab. *caliginosa* Comst.) is a unique aberration of the Hydaspe Fritillary which was captured in Modoc County by that indefatigable collector, James E. Cottle. The upper surface is accurately pictured in the plate. A detailed description of the inferior aspect will be found in the "Bulletin, Southern California Academy of Sciences," Vol. XXIV Part 3, Sept. 1925. Needless to say, it will always remain a great rarity.

Illustrated. Plate 26. ♂ fig. 3.

THE IRENE FRITILLARY *(Argynnis irene* Bdv.) is a high altitude species, occurring in a limited territory, from Siskiyou to Plumas Counties. It is characterized by smaller size, and narrow restricted lines and reduced spots on the upper surface, superimposed on a light ground color. The under side is also lighter in shade than most of our Argynnids, with no suggestion of silvering on the usual spots.

On the secondaries a well defined light buff submarginal band occurs, and numerous dashes of the same shade are distributed over the discal and basal portions, between large oval buff spots.

*Irene* reaches its period of maximum flight in late July and August. It is rare in collections.

Early Stages. Entirely unknown.

Illustrated. Plate 26. ♂ fig. 4; ♂ under side fig. 5; ♀ fig. 6.

THE NEVADA FRITILLARY *(Argynnis nevadensis* Edw.) belongs to a group in which the characteristic feature is a powdering of green scales on the inferior surface of wings.

This butterfly is partial to arid districts. It occurs in the Mono Basin, and the volcanic plateaus to the north, including the more arid portions of the adjacent Sierras. In the Mammoth district of Mono County, it was easily netted while feeding on a species of mint, but when not so engaged was a difficult butterfly to capture.

The green coloration is probably an adaptation to the desert environment, the vegetation of which is predominantly of a blue-green or gray-green shade.

*Nevadensis* is at times abundant, but the sparsely settled districts in which it occurs make it a desirable species, from the collector's standpoint. It flies in July.

Early Stages. We know nothing of these.

Illustrated. Plate 27. ♂ fig. 1; ♀ fig. 3; ♀ under side, fig. 2.

SNYDER'S FRITILLARY *(Argynnis snyderi* Skin.) is a Great Basin form, which comes within the territory embraced in this work, only in the northeastern semi-desert areas.

It is a large, boldly marked species, with an unusually light ground color on the inferior surfaces. The characteristic feaures of this butterfly are in the coloration of the under side of secondaries. The spots are well silvered, and a band of clear yellow-buff occurs in the submarginal area. Internal to this is a uniform olive-buff ground color, on which the silver spots are superimposed.

*Snyderi* is fairly common in Utah, but in California it is a great rarity. The examples illustrated on the colored plate were taken at Susanville, where the insect showed a preference for the blossoms of *Monardella lanceolata.*

Early Stages. Unknown.

Illustrated. Plate 27. ♀ fig. 7; ♂ under side fig. 8.

GUNDER'S FRITILLARY *(Argynnis snyderi gunderi* Comst.) is a rare race of the preceding species occurring in northeastern California. It was named for Jean Gunder, of Pasadena. This butterfly differs from other Argynnids in the ground color of the under side, which is a clear lemon-buff of a lighter shade than any other member of the genus. A few greenish scales occasionally are present, in close relation to the silver spots. The latter are always lustrous and conspicuous. *Gunderi* is a great rarity, only a few examples thus far being known.

Illustrated. Plate 27. ♂ fig. 4; ♀ fig. 5; ♂ under side fig. 6.

THE CALIFORNIA FRITILLARY *(Argynnis snyderi californica* Skin.) is a race recently separated by Dr. Skinner, which has heretofore caused much confusion on account of an error of Edwards. It stands in most collections under the name *coronis,* and the true *coronis* has been designated *liliana.*

*Californica* is a low altitude race of *snyderi,* occurring in the coast ranges and interior valleys of the state, from the San Francisco Bay region to the Tehachapis. It is a large, well silvered form, considerably darker than the parent species, in which the olive-green shade of the under surfaces is replaced by a soft brown. Southern examples are slightly lighter in color. The marginal band of silver spots is reduced to a series of triangles, each of which is deeply shaded on its inner edge.

This handsome fritillary is extremely fond of sipping nectar from thistles, and when so engaged is easily captured. It is not uncommon in favored seasons, in the months of June and early July.

Early Stages. As with most of the Argynnids, these are quite unknown.

Illustrated. Plate 29. ♂ fig. 4; ♀ fig. 5; ♀ under side fig. 6.

THE LESSER UNSILVERED FRITILLARY *(Argynnis adiaste* Behr.) belongs to a group of Argynnids in which the ground color of the under side is of a light shade, and the usual silver spots have a faded appearance, and are quite devoid of lustrous scales. *Adiaste* is the smallest and darkest member of the group. It is so unlike any other member of the genus that the colored figures will serve at once to differentiate it.

The species is limited to the coast ranges south of San Francisco, its chief citadel being in the Santa Cruz Mountains. In June and early July it may be taken in fair abundance.

As would be expected of a dark form, it is a forest lover, delighting in the flowered glades adjacent to the redwood groves. Roadside thistle patches are its special predilection, and when engaged in feeding it is easily netted.

Early Stages. Undetermined.

Illustrated. Plate 28. ♂ fig. 10; (The sex designation of ♀ on this figure is an error.) ♂ under side fig. 11; ♀ fig. 12. (Not ♂ as marked.)

CLEMENCE'S FRITILLARY *(Argynnis adiaste clemencei* Comst.) is a race of the previously treated species which occurs in the mountains adjacent to Atascadero. It was first taken by Mr. Victor Clemence, and was named for the discoverer. This race has served to confirm Dr. Holland's prediction that *atossa* might be a variation of *adiaste*, since it supplies the connecting link between these two forms. In locality and maculation, it is exactly intermediate in position, as a glance at the colored figures will disclose. The types were taken late in June.

*Clemencei* is at present a rarity, but it is possible that in its restricted locality it may fly in fair abundance.

Illustrated. Plate 28. ♂ fig. 7; ♀ fig. 9.

THE UNSILVERED FRITILLARY *(Argynnis adiaste atossa* Edw.) was, for a long time, considered one of the rarest Argynnids in America. Of late years, however, collectors have explored more thoroughly the ranges adjacent to the Tehachapi (where it was first reported) and have taken it in large numbers. Probably a record catch was made by the author, when more than five hundred examples were netted in a single day, in the Tejon Mountains. Even with this considered, it is still far from common, due probably to its restricted range in the Tehachapi, Tejon and Sierra Madre Mountains.

*Atossa* is a large pale southern race of *adiaste,* with lighter ground color on both superior and inferior surfaces. The creamy-buff of the under side, and the faded appearance of the spots, serve at once to differentiate it from other members of the genus. Early July is its chosen season.

The Unsilvered Fritillary is an extremely agile insect, and unless it stops to feed, or is "hovering" in search of a mate, there is small prospect of netting it. Fortunately it delights in the flowers of the California horse-chestnut, and may be captured while feeding. One or two other flowering plants also aid the entomologist, in halting its vigorous flight.

EARLY STAGES. These are quite unknown, in spite of the fact that many lepidopterists have searched assiduously for larva over its known haunts. Violets undoubtedly serve as the food-plant of the caterpillar, as the presence of *Viola pinctorum* has been noted in large numbers, in the fields where *atossa* was emerging.

ILLUSTRATED. Plate 28. ♂ fig. 5; ♀ fig. 4; ♂ under side fig. 8.

THE TEJON FRITILLARY *(Argynnis adiaste atossa* f. *tejonica* Comst.) is the silvered form of *atossa.* Very rarely an example will be found which shows silvering, in greater or lesser degree, on the usual spots of the inferior surface. The occurrence is very uncommon, however; probably in a ratio of not more than one specimen in five or six hundred. These silvered examples are nearly always females.

ILLUSTRATED. Plate 28. ♀ under side, fig. 6. The figure does not do justice to this example, which is silvered on all of the customary spots, although the scales are sparsely scattered on a few of these.

SEMIRAMIS' FRITILLARY *(Argynnis semiramis* Edw.) is a handsome species which is limited in range to the southern Sierras, from the San Gabriel Mountains to San Diego County.

The characteristic features of this queenly butterfly are the rich ruddy glow of the superior surfaces, combined with elongate intensely silvered spots on the under side.

*Semiramis* is a distinct species. Some authors have confused it with *atossa,* on account of the similarity of maculation on the upper side, but the lustrous silvering of the more southerly form is a constant feature, and the richer ground color of both upper and under surfaces is of a totally different character. Silvered examples of *atossa* bear not the slightest resemblance to *semiramis,* which would not be the case if the two were related. July is its favored month.

EARLY STAGES. Undetermined.

ILLUSTRATED. Plate 28. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

THE CALLIPPE FRITILLARY *(Argynnis callippe* Bdv.) is a distinctly marked species which enjoys a wide range throughout the lowlands and foothills of the coastal regions of central and southern California.

The ground color of the superior aspect of this common butterfly is considerably lighter than the majority of the Argynnids, and the bands of black are, for the most part, heavy and confluent. In the basal area of both wings there is a heavy powdering of black scales. The spots on the under side are well silvered, and a sharply defined buff submarginal band is present on the secondaries.

Southern California examples are lighter in color and maculation than those from the San Francisco Bay region, and Jean Gunder has separated them under the racial name *comstocki.* The figures are of this southern race. Drs. Barnes and Benjamin do not consider it sufficiently distinct to warrant a name.

When the grassy foothills have changed their verdant spring garb for the tan of late May and June, this spangled beauty comes forth, to flaunt its lustrous wings in the bright sunlight. Always it seeks the haunts where, earlier in the season, the yellow violets peeked at one another. One may not recognize their withered leaves, but instinctively the female *callippe* knows that in the coming year her progeny will find them, and places her eggs accordingly.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 29. ♂ fig. 1; ♀ fig. 2; ♂ under side fig. 3.

THE CORONIS FRITILLARY *(Argynnis coronis* Behr) is a small, distinctly marked species, which has a rather limited range in the territory centering in Mt. St. Helena, north of San Francisco.

On the superior surfaces *coronis* has the spots more restricted than in the preceding species, and the basal area is not as dark. The under side of the forewings is yellowish-buff, the base and hind margin to below the cell, brown, with buff on the median interspaces. The outer end of the cell is yellowish-buff. The subapical patch is brown, adorned by two or three well silvered spots. The five upper marginal spots are well silvered. The hind wings are brown, but little mottled with buff. The spots are well silvered. The marginal belt is narrow, and of an ochreous-brown. Wright's *baroni* is listed as an aberration of this species. It is illustrated in Wright's book as Figure 131.

Early Stages. Brief notes of these are given in Edwards' work, where the egg and young larva are described. Nothing is known of the adult caterpillar or chrysalis.

Illustrated. Plate 29. ♂ fig. 7; ♀ fig. 8.

THE RUPESTRIS FRITILLARY *(Argynnis rupestris* Behr) occurs in the northern tier of counties. June to September represents its season.

The heavy black bands of the upper surfaces, with dark shading in the basal area, and the peculiar characteristic of the under side of secondaries, in which the marginal spots are silvered and the others a creamy-buff, are the distinguishing features of this species.

Early Stages. Unknown.

Illustrated. Plate 29. ♂ fig. 9; ♀ fig. 10; ♀ under side fig. 11.

THE YUBA FRITILLARY *(Argynnis juba* Bdv.) is a mountain butterfly, occurring in the northern and central Sierras.

The under surface of this butterfly is noted for its bright color, and large silver spots. There is a ruddy cast over the basal part of the primaries. On the hind wings a broad buff marginal band is present, and the spots are large and well silvered. The ground color of the inner two-thirds of secondaries is a rich brown. These features, in combination with the rather light shade of the upper surfaces, and the narrow clear-cut lines and small dots, will serve to differentiate it. It flies in late June and early July.

Early Stages. These still remain undiscovered.

Illustrated. Plate 30. ♂ under side fig. 1; ♀ fig. 2.

THE PLAIN FRITILLARY *(Argynnis juba inornata* Edw.) is an unsilvered race of the former species. The types were collected by James Behrens at Downieville. It is a highly prized butterfly, and is characterized by a lighter coloration on the under side, with a complete absence of silvering. Otherwise it closely resembles *juba.*

ILLUSTRATED. Plate 30. ♂ fig. 3; ♀ under side fig. 4; ♀ fig. 5.

THE MACARIA FRITILLARY *(Argynnis macaria* Edw.) is limited in range to the Greenhorn, Tehachapi, Tejon and Sierra Madre Mountains of southern California. Although it is counted a rarity by collectors, on account of its restricted habitat and short season, it is nevertheless abundant in favored localities, during the months of June and early July.

*Macaria* is characterized by a light ground color and restricted bands and spots on the upper surfaces, combined with a very light yellow-buff on the under sides. The silvering is brilliant, although the spots are moderate in size. A reddish suffusion occurs in the basal portion of primaries. The submarginal buff band of secondaries is clear and wide, and the same shade carries into the remainder of the wing, slightly darkened by a few brownish scales.

The species has been taken in great numbers, in the upper part of Bouquet Canyon, Los Angeles County, flying over open hillsides, where yellow violets were abundant earlier in the season. Diligent searching has failed to locate the caterpillars.

ILLUSTRATED. Plate 30. ♂ fig. 7; ♀ fig. 6; ♂ under side fig. 8.

THE UNSILVERED MACARIA *(Argynnis macaria laurina* Wright) is, as its common name indicates, an unsilvered form of the above species. *Laurina* occurs more commonly in the northern limits of *macaria's* range, but is still very rare in collections.

ILLUSTRATED. Plate 30. ♂ under side fig. 9.

THE MOUNTAIN VAGABOND *(Argynnis montivaga* Behr) stands in most collections under the synonymic name *egleis.* It is a dwarfed species that has its habitat on the higher ranges of the Sierras, from Lassen County south to Kern. In the northern limit of its territory it assumes a darker and heavier coloration which has its culmination in the race *oweni.* The reverse is true in its southernmost extension, where the race *tehachapina* shows the opposite extreme. *Montivaga* is a very common butterfly in the high Sierras. It is characterized by heavy, more or less confluent bands on the upper surfaces, and a rather dull coloration below, in which a sordid buff is the prevailing tint.

Jean Gunder has described an aberration of *montivaga* under the name *mammothi*, which differs from the typical insect in having the submarginal row of spots much reduced on the primaries, and entirely absent on secondaries. This gives, on the upper surface, the appearance of a broad ferruginous area. The type was illustrated in the "Entomological News" of May, 1924, color plate 11, and was taken in the Mammoth Camp region of Mono County.

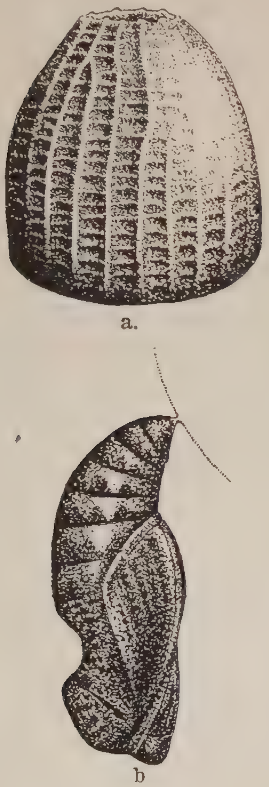


FIGURE A34
Early Stages of
*Argynnis montivaga*
a. Egg, Highly Magnified.
b. Chrysalis, Enlarged

Early Stages. Miss Ximena McGlashan has made a few brief notes concerning these, but her statement as to the various food-plants must be erroneous. Probably they resulted from the fact that Argynnids often lay their eggs indiscriminately on a variety of plants. These are always in the vicinity of violets, though the latter may be withered and unrecognizable. The young larvæ hibernate through the winter, and find the succulent food-plant when they emerge in the spring.

Edwards in his third volume has given us accurate information of the complete metamorphosis. Figure A34 was redrawn from his illustrations.

Egg. This is of a yellow color, and is pictured in Figure A34a.

Caterpillar. When mature, of a gray-brown color, much speckled and striped. Dorsal and subdorsal black lines occur, which are edged with sordid white. Numerous branching spines, of a dull white or dirty yellow are present, arranged in a manner characteristic of the genus.

Chrysalis. Pictured in Figure A34b. Color, a dark brown, variously speckled.

Illustrated. Plate 31. ♂ fig. 4; ♀ fig. 5; ♂ under side fig. 6.

MALCOLM'S FRITILLARY *(Argynnis montivaga malcolmi* Comst.) is a large race of *montivaga* occurring in the sierran foothills along the eastern base of the mountains, in the Mono Basin. It is found most plentifully in the Mammoth Lakes region, during July.

This large and boldly marked race shows the influence of a semiarid environment in its heightened color and lighter under surfaces. It is usually well silvered, but rarely examples occur with this lustrous scaling reduced or obsolescent.

This species or race intergrades gradually into typical montivaga in response to an increase of altitude. A series of specimens taken at 6,000 to 11,000 feet gives a complete picture of this intergradation.

*Malcolmi* is at times abundant in mid July, but will always be rare in collections, on account of the inaccessibility of the territory in which it occurs. It was named for Mr. George Malcolm, of Los Angeles.

Illustrated. Plate 31. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

THE TEHACHAPI FRITILLARY *(Argynnis montivaga tehachapina* Comst.) is a lightly marked southern race of the Mountain Vagabond, in which the silvering is practically obsolescent, and the discal band on the upper side of secondaries is reduced to a series of five spots that show only a trace of the connecting line.

The types were taken at high elevations in the Tehachapi Mountains, which is the southernmost point in which *montivaga* (represented by this race) is found. Possibly other regions will later be discovered in which this widely distributed species has undergone the loss of the silver markings and a reduction of the black scaling, in response to a semi-arid environment. At present *tehachapina* is known only from the types.

Illustrated. Plate 31. ♂ fig. 10; ♀ under side fig. 11; ♂ under side fig. 12.

OWEN'S FRITILLARY *(Argynnis montivaga oweni* Edw.) is a local northern race of *montivaga* occurring in the Mount Shasta region. It is a heavily marked form on the upper side, with a deep ferruginous ground color on which lighter areas occur corresponding to the position of the silver spots below. On the under surface, the coloration is richer, and more contrasted than in the typical insect.

*Oweni* is abundant in July, in its restricted locality. It is still somewhat rare in collections however, on account of the small number of lepidopterists who have visited its habitat.

Illustrated. Plate 30. ♂ fig. 10; ♀ fig. 11; ♀ under side fig. 12.

THE MORMON FRITILLARY *(Argynnis mormonia* Bdv.) is a small, lightly marked species, occurring in the Sierras at suitable elevations. It was found in abundance in the Monache Meadows of Tulare County, west of Olancha Peak, at an altitude of 8,000 feet, and has also been recorded for Mineral King.

*Mormonia* is a late insect, reaching its period of greatest flight early in August.

If Drs. Barnes and Benjamin are correct in placing *Argynnis errina* Edw. as a race of *mormonia,* it would appear likely that the latter is more widely distributed than heretofore supposed, since *erinna* occurs along the California-Oregon border.

Early Stages. Unknown.

Illustrated. Plate 31. ♂ fig. 7; ♂ under side fig. 8; ♀ fig. 9.

THE ERINNA FRITILLARY *(Argynnis mormonia erinna* Edw.) is a small, delicately marked race of the Mormon Fritillary occurring in certain of the Rocky Mountain and Great Basin states, and reaching the territory embraced in this work only in the Fort Klamath region, from whence it ranges northward into Washington.

This form was described in the "Canadian Entomologist," Vol. 15, p. 33. The under surfaces bear the usual silver spots, and the secondaries are a dark ferruginous, but little mottled with yellow-buff.

Records of the capture of this butterfly in California were noted too late for it to be included in the illustrations.

It will be observed that, in drawing comparisons between the various Argynnids, the differentiation is based primarily on the markings of the males. It must be borne in mind that females in this genus are characterized by slightly different markings and colorations. Wherever possible this difference has been made apparent in the colored illustrations. The principal variance in the sexes is as follows:

In the females, the ground color of the superior surfaces appears somewhat lighter, due to the fact that the areas immediately over the silver spots of the under side are frequently of a light buff shade. On the under side of primaries, in the basal area, and along the posterior border, there is frequently a ruddy shade that is absent in the male. In those forms which are silvered, the female always shows a more brilliant lustre than the male.

Another point that will be noted by the collector is the relative scarcity of the females, and the fact that in many species, they are on the wing at a considerably later date than the males.

## THE SMALL FRITILLARIES. Genus BRENTHIS Hbn.

THE WESTERN MEADOW FRITILLARY *(Brenthis epithore* Edw.) occurs throughout the Sierras, ranging thence into the mountains of the northern counties above San Francisco Bay. It is also found in the Santa Cruz Mountains. It frequents wooded areas, and is especially abundant in regions of plentiful moisture.

In lower altitudes it emerges in May, but with an increase in elevation its appearance is retarded until June or July.

Early Stages. Unrecorded, but probably very similar to those of the eastern *Brenthis bellona,* which have been described by numerous writers.

Larval food-plant. *Viola ocellata,* according to Miss McGlashan.

Illustrated. Plate 26. ♂ fig. 9; ♂ under side fig. 11.

THE WAWONA FRITILLARY *(Brenthis epithore* ab. *wawonæ* Gunder) is an aberrant form of the Western Meadow Fritillary, recently described by Jean Gunder. The type of this interesting freak is accurately pictured in the colored plate. It was taken at Wawona, south of Yosemite.

Illustrated. Plate 26. ♂ fig. 10.

## THE CHECKER-SPOTS. Genus EUPHYDRYAS Scud.

THE CHALCEDON CHECKER-SPOT *(Euphydryas chalcedona* Dbldy. & Hew.) is by far the commonest and most widely distributed species of this genus in western America. It is also one of the most involved on account of the large number of races and aberrations that have resulted from altitudinal, thermal and geographic influences.

The typical insect is found in all of the canyons and lower mountains of the entire state. Southern examples show, on the average, a greater development of the red spots along the margins of both wings. *Chalcedona* appears in great abundance during the spring, reaching its peak in May and early June. Its flight is indolent, with frequent stops for refreshment on a variety of flowers, and hence it is easily captured.

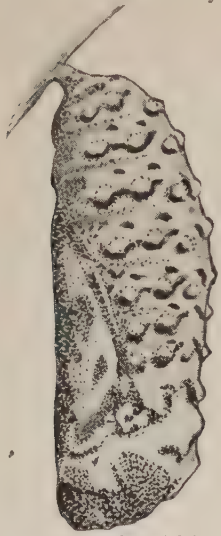


FIGURE A35
Chrysalis of
*Euphydryas chalcedona*

Early Stages. These have been frequently recorded by numerous writers. The caterpillar and chrysalis were figured by W. H. Edwards, and numerous notes as to habits were given by the same author in "Papilio," Vol. IV, p. 63.

Egg. Of usual form for the genus; truncated, the top depressed and bottom rounded, with about 20 ridges on the upper third, running longitudinally. The color is at first lemon-yellow, changing later to crimson, and before hatching to black.

Caterpillar. When mature, spiny, the predominating color, black, with a whitish dorsal stripe, and a broken band of the same, laterally placed. (Examples from lower altitudes fail to show these stripes.) The entire surface is covered with small white tubercles bearing curved white hairs. A comparison of larvæ from different faunal areas would probably show wide variation.

Chrysalis. Shown in fig. A35. Color, gray and pearl, with spots of orange or black, and a number of black bars.

Larval food-plants. Include many different genera such as *Mimulus, Rosa, Diplacus, Scrophularia, Pentstemon, Antirrhinum, Collinsia,* etc. The monkey-flowers and figworts seem to be the favorites.

Illustrated. Plate 32. ♂ fig. 1; ♀ fig. 3; ♀ under side fig. 2.

THE FUSED CHECKER-SPOT *(Euphydryas chalcedona* ab. *fusimacula* Barnes) is one of numerous aberrations occurring in the above species. The colored figure will serve to differentiate it, the special feature being the fusion and elongation of the yellow spots on the upper side. As with most aberrant butterflies, it is rare.
ILLUSTRATED. Plate 32. ♂ fig. 6; ♂ under side fig. 5; ♀ fig. 4.

THE HALF-FUSED CHECKER-SPOT *(Euphydryas chalcedona* ab. *suprafusa* Comst.) is an aberration of *chalcedona* in which the yellow spots of the forewings are fused and elongated, the secondaries being normal.*
ILLUSTRATED. Plate 32. ♀ (type) fig. 9.

THE INFRA-FUSED CHECKER-SPOT *(Euphydryas chalcedona* ab. *fusisecunda* Comst.) varies from the above in having the fused and elongated marks confined to the secondaries, while the primaries are normal.
ILLUSTRATED. Plate 32. ♀ (type) fig. 12.

THE MARIANA CHECKER-SPOT *(Euphydryas chalcedona* ab. *mariana* Barnes) shows a melanism or darkening of the wings. In this striking aberration the superior surfaces are practically devoid of all spots—probably in extreme examples entirely so.
ILLUSTRATED. Plate 32. ♀ fig. 7.

THE SUPRA-MELANIC CHECKER-SPOT *(Euphydryas chalcedona* ab. *supranigrella* Comst.) is an aberration in which the primaries are practically devoid of spots, the secondaries being normal.
ILLUSTRATED. Plate 32. ♂ (type) fig. 8.

THE HALF-MELANIC CHECKER-SPOT *(Euphydryas chalcedona* ab. *hemimelanica* Comst.) combines two aberrational tendencies; the forewings showing a fusion of the yellow markings, while the secondaries are practically devoid of spots.
ILLUSTRATED. Plate 32. ♂ (type) fig. 11; ♀ under side fig. 10.

Two other aberrations of *chalcedona* have received names, i. e. *omniluteofuscus* Gunder and *hemiluteofuscus* Gunder. The reader is referred to "Entomogolical News," Vol. 36, Plate V, for illus-

---

*Synonymous with *E. chalcedona* ab. *lorquini* Oberth.

trations of these. Probably the naming of color sports has been pushed beyond all reason in this variable genus. Later writers may decide to retire all of these variants as synonyms, in order to avoid the burdening of our lists with a multiplicity of names. For the present, however, we include them.

It is hoped that workers in the future will subject *chalcedona* to careful experimentation along the lines followed by Mr. Wilhelm Schrader with *Junonia*, in order to determine the factors which are responsible for the many different forms and aberrations.

DWINNELL'S CHECKER-SPOT *(Euphydryas chalcedona dwinnelli* Hy. Edw.) is a form of the Chalcedon Checker-spot in which the red coloration invades the forewing into the discal area, and the marginal row of red spots occurs in both primaries and secondaries. (The illustration does not show these on the secondaries and is hence not quite typical.) The submarginal row of yellow spots on the secondaries is reduced or absent. Otherwise this form resembles typical *chalcedona*.

The types of *dwinnelli* were taken at the McCloud Fishing Station, Shasta County, but examples of similar coloration occur in other portions of the state.

ILLUSTRATED. Plate 33. ♂ fig. 1.

MACGLASHAN'S CHECKER-SPOT *(Euphydryas chalcedona macglashanii* Rivers) is a local race of *chalcedona* occurring in the mountainous districts north of Lake Tahoe. The specimen figured on plate 33 is from Truckee, the type locality, and exactly agrees with Rivers' description. One of the distinguishing features of this race is the relatively uniform size of the yellow spots, which are approximately equidistant from each other, and give the insect a checkered appearance. It averages smaller in size than other forms.

The larva, as described by Prof. Rivers, differs from that of typical *chalcedona* in several respects, but as previously stated, this difference does not in our estimation indicate specific difference in the imago. In many butterflies that are very constant in marking we find the widest possible variation in the caterpillars. Dr. Behr endeavored to separate a race of *chalcedona (cooperi) on the* strength of a difference in the coloration of the larva, but admitted that the butterflies were exceedingly difficult to distinguish.

*Macglashanii* flies in late June and early July.

ILLUSTRATED. Plate 33. ♂ fig. 2.

THE OLANCHA CHECKER-SPOT *(Euphydryas chalcedona olancha* Wright) is an alpine race of *chalcedona* found at high elevations through the Sierras. The types were taken near Olancha Peak, Inyo County, but the form ranges throughout the central Sierras, at least as far north as the Tahoe region. It differs from other forms of this highly variable species in having, on the upper side, a greater development of the yellow spots, and in the presence of two red points in the cell of primaries. *Olancha* is on the wing in July. It is a rare insect.

ILLUSTRATED. Plate 33. ♂ fig. 3; ♀ fig. 6.

EDWARD'S CHECKER-SPOT *(Euphydryas colon* Edw.) is a smaller species than the preceding, and the wings are of a different shape—the outer edge of primary being somewhat more rounded. The marginal red spots are well defined in this butterfly, and there is a black area internal to the submarginal yellow spots of the secondaries which immediately separates it from any other member of the group.

*Colon* is a northerly insect, ranging from the counties bordering on the Oregon line, to Washington, and thence east into Idaho.

EARLY STAGES. Unrecorded.

ILLUSTRATED. Plate 33. ♂ fig. 7; ♂ under side fig. 8; ♀ fig. 9.

HUELLEMANN'S CHECKER-SPOT *(Euphydryas colon* ab. *huellemanni* Comst.) is an aberrant form of the above species in which the outer yellow spots of primaries are enlarged and somewhat fused, and all of the spots of secondaries reduced or obsolescent. The types figured were taken by Mr. Otto Huellemann at Wallace, Idaho. While this aberration has not been recorded for California, and therefore should not properly be incorporated here, it is included in the hope that it may eventually be discovered within our borders.

ILLUSTRATED. Plate 33. ♂ fig. 5; ♀ fig. 4.

BARON'S CHECKER-SPOT *(Euphydryas baroni* Edw.) is a handsome species which has its home in Mendocino and Lake Counties. It is apparently abundant in the Russian River Valley, but is still somewhat rare in collections. June seems to be its favored month of flight.

The distinguishing feature of this butterfly is the alternate bands of red and yellow spots on the outer portion of upper side of secondaries, and the brilliant quality of the red coloration.

W. G. Wright's *mirabilis* is an aberration of this species, although he confused it with *hoffmanni*. It is figured on Plate XX, "Butterflies of the West Coast."

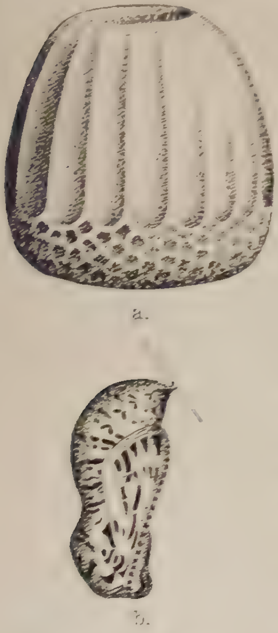


FIGURE A36
Early Stages of *Euphydryas baroni*
a. Egg, Greatly Magnified.
b. Chrysalis. Enlarged.

Early Stages. Described by W. H. Edwards in the "Canadian Entomologist," Vol. 11, p. 129, and also dealt with in his "Butterflies of North America," Vol. 3.

Egg. Shown in Figure A36a, the color being a yellow-green. The eggs are laid in clusters.

Caterpillar. When first hatched, these spin a web which covers the entire colony. This is occupied until the time of hibernation, which, with most western species of this genus, occurs after the third moult. The larvæ lay dormant through the winter, and feed to maturity the following spring. The mature caterpillar is covered with branching spines. The body is velvety black, dotted with small whitish points. The dorsal spines are yellow, with black bristles. Those over the feet are yellow—all the others black. The head is dark brown, covered with black hairs.

Chrysalis. Pictured in Figure A36b. It is a delicate blue-gray, with buff wing cases that are slightly touched with red, and lined with orange nervules. The surface is mottled with black spots and lines, as indicated on the drawing.

Larval food-plants. *Scrophulariaceæ.*

Illustrated. Plate 33. ♂ fig. 10; ♀ fig. 12; ♀ under side fig. 11.

THE EDITHA CHECKER-SPOT *(Euphydryas editha* Bdv.) has a greater percentage of red than in the preceding butterfly. This color invades the discal area of the upper side, but is of a duller shade than in *baroni.* The yellow spots are large and clear and those of the submarginal line of secondaries markedly crescentic.

*Editha* is a lowland species, occurring in isolated colonies throughout central California. It is not a common insect.

Early Stages. Described in part by Henry Edwards in the "Proceedings of the California Academy of Sciences," Vol. 5, p. 167.

Egg. Unknown.

Caterpillar. Dull black, with seven rows of many branched spines, all of which have a bluish tinge. Those of the second lateral row arise from tuberculated orange spots. Feet and prolegs brown, inclining to a fleshy tint.

Chrysalis. Shorter and rounder than that of *E. chalcedona*. The ground color is a dull cream-white. Each segment has a transverse row of orange spots, bordered anteriorly by black dashes. On the wing covers are some broad black waved lines and a few black patches occur about the head and thoracic regions.

Larval food-plants. Listed by Henry Edwards as *Erodium cicutarium*, and various species of clover and violet.

Illustrated. Plate 34. ♂ fig. 1; ♀ fig. 3; ♂ under side fig. 2. (Figures 1 and 3 are reproduced from Dr. Oberthur's rare work, and were drawn from the types. The left hand portion of each figure represents the under surface.)

BEHR'S CHECKER-SPOT *(Euphydryas quino* Behr) has usually been listed as a separate species, but more than likely it is merely a race of *editha* in which the red coloration has encroached on certain areas that are yellow in the last mentioned species.

Behr's Checker-spot occurs in isolated colonies from Orange County south to the Mexican line. A few captures have also been reported in the deserts to the east of the Sierras, the most northerly being in the Mono Basin. It prefers semi-arid districts.

In southern California it appears in March and April. An abortive second, or perhaps third brood occasionally occurs in the fall.

Early Stages. Unrecorded, although larvæ have been reared by a number of workers.

Larval food-plant. *Plantago.*

Illustrated. Plate 34. ♂ fig. 4; ♀ fig. 6; ♀ under side fig. 5.

FIELD'S ABERRANT CHECKER-SPOT *(Euphydryas quino* ab. *fieldi* Gunder) is a melanic variant of *quino.* The type is pictured and obviates the necessity of a description. This unique aberration was taken by George Field at San Diego, in April.

Illustrated. Plate 34. ♂ fig. 16.

THE AUGUSTA CHECKER-SPOT *(Euphydryas quino augusta* Edw.) is a dwarfed mountain race of the former species, occurring at moderate elevations in the San Bernardino Mountains, and possibly also in the ranges to the south.

In this form the black areas and lines are much reduced, and the yellow markings are more pronounced. The discal yellow band on upper side of secondaries is nearly confluent.

*Augusta* is on the wing in June. It is relatively rare.

Illustrated. Plate 34. ♂ fig. 7; ♀ fig. 8; ♂ under side fig. 14.

THE ABERRANT AUGUSTA *(Euphydryas quino augusta* ab. *augustina* Wright) is a unique aberration of *augusta,* which is thus far known only from the type. The figures are taken from Mr. Wright's illustrations.

Illustrated. Plate 34. ♂ fig. 9; ♂ under side fig. 10.

THE RUDDY CHECKER-SPOT *(Euphydryas rubicunda* Hy. Edw.) occurs in the Sierras, from Tulare County north to approximately Sierra County. In this species the males are rather dark, and both sexes are devoid of yellow spots on the outer half of the upper side of secondaries.

It is possible that the specimens figured are not typical *rubicunda,* as they are smaller than *baroni,* whereas Dr. McDunnough states that *rubicunda* is larger than that species. In all other respects they agree with the original description. Perhaps examples from higher altitudes are dwarfed. The species is on the wing in July. It is not common.

Early Stages. Undescribed.

Illustrated. Plate 34. ♂ fig. 11; ♂ under side fig. 12; ♀ fig. 13.

THE ABERRANT RUDDY CHECKER-SPOT *(Euphydryas rubicunda* ab. *rubrosuffusa* Comst.) is a unique aberration of *rubicunda* in which the black and yellow markings are much reduced. This is particularly marked on the upper side of secondaries, which are almost a solid red on the outer two-thirds of wing, except for the fine black stripes of the nervules. The type was taken by George Malcolm in the Mammoth Lakes district of Mono County. So far as known, it is a unique.

ILLUSTRATED. Plate 34. ♀ (type) fig. 15.

FOX'S ABERRANT CHECKER-SPOT *(Euphydryas rubicunda* ab. *foxi* Gunder) represents another aberrational tendency in this variable species. This form is semi-albinic, the ground color of both wings being of a lighter cast than normal, and the yellow spots not so strongly contrasted.

The insect was named for Charles L. Fox, of San Francisco. The type was taken July 13th, at Gold Lake, Sierra County.

ILLUSTRATED. Plate 34. ♂ fig. 17. (Paratype.)

Another aberrant form of *rubicunda* was recently described by Mr. Gunder, in the "Entomological News," of January, 1926, p. 3. This was named *albiradiata*. The colored figure there shown will serve to identify it.

THE CLOUD-BORN CHECKER-SPOT *(Euphydryas nubigena* Behr.) is a small, lightly marked species, occurring in a limited range through the high Sierras. This bright little insect was the dominant Checker-spot in the Monache Meadows of Tulare County, during August. Not unlikely *nubigena* will prove to be a delicately marked dwarf form of *rubicunda* that has adapted itself to alpine areas of somewhat reduced rainfall. The species has rather weak powers of flight, and pauses frequently to rest, hence it is easily captured.

EARLY STAGES. Unrecorded.

ILLUSTRATED. Plate 35. ♀ fig. 1; ♂ dwarf fig. 2; ♂ fig. 3; ♂ under side fig. 4; ♀ aberration fig. 6. (Not ♂ as marked.)

THE SIERRA CHECKER-SPOT *(Euphydryas sierra* Wright) is a large alpine species in which the black areas are so much reduced that the dominant tone is a rich red. The colored figures will serve to differentiate it from other members of the genus. *Sierra* is taken in high altitudes of the central Sierras, particularly in the Tahoe region where it flies in June and July.

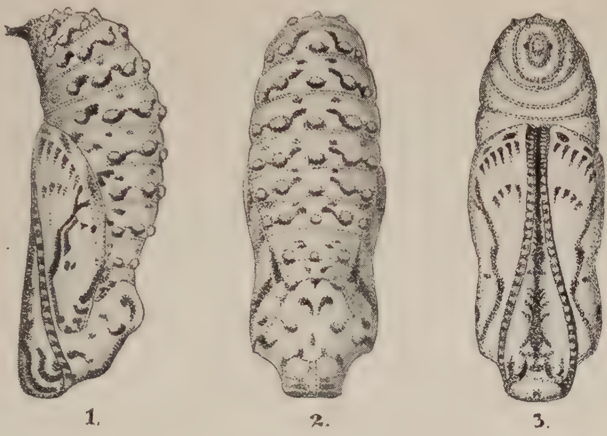


FIGURE A37
Chrysalis of *Euphydryas sierra*, Much Enlarged

Early Stages. Described in part by the author in the "Bulletin, Southern California Academy of Sciences," Vol. 20, p. 47.

Egg. Unknown.

Caterpillar. When mature, longitudinally striated alternate black and creamy-white—the light streaks being interrupted with blotches of yellow at the base of spines. Some of the latter are yellow, the remainder, black.

Chrysalis. Illustrated in Figure A37. The color is a silvery-white, changing to a gray-green. Numerous brownish-black blotches and striations are present, and a series of papillæ occur on the abdominal portion, which are tipped with yellow.

Larval food-plant. This was not positively identified, but resembled a *Montia*.

Illustrated. Plate 35. ♂ fig. 7; ♂ under side fig. 8; ♀ fig. 9.

THE ABERRANT SIERRA CHECKER-SPOT *(Euphydryas sierra* ab. *umbrobasana* Comst. or Gunder) is a handsome aberration of the former species which was taken by the author in the Tahoe region, near Mt. Tallac. It was illustrated and named in plate 35, which was distributed to a number of lepidopterists. From this picture

Jean Gunder drew certain comparisons in an article published in the "Entomological News" which appeared before a technical description was published by the writer, hence the authorship of this butterfly is in doubt. Only two of these handsome aberrants are at present known, so it may be counted a great rarity.

Illustrated. Plate 35. ♂ (type) fig. 5.

Another aberration of *Euphydryas sierra* was recently described in the "Entomological News," Vol. 36, p. 197, by Jean Gunder, under the name *magdelenæ.* The reader is referred to this, and also the excellent illustration on plate V of the same issue, as a means of identifying this strikingly marked butterfly.

WHEELER'S CHECKER-SPOT *(Euphydryas wheeleri* Hy. Edw.) was first recorded from Nevada. It is a Great Basin species which reaches California in the Mono Lake district and adjacent regions, where it is rare. This butterfly is distinguished by the large amount of whitish-yellow in the basal portion of the upper side of secondaries. It is partial to a desert environment.

Early Stages. Mead, in the Wheeler Survey, gave a few brief notes on the larva and chrysalis, although he confused the species with *nubigena.*

Egg. Unknown.

Caterpillar. Ground color white, slightly marbled with black. The head is black and hairy. The second segment bears a black collar-like mark. Each of the succeeding segments, except the last, has seven black branching spines. The bases of the dorsal spines are yellowish—of the next row black, and so on, alternating.

Chrysalis. Whitish-gray, marked with black and yellow dots.

Larval food-plant. *Plantago.*

Illustrated. Plate 35. ♂ fig. 10; ♂ under side fig. 11; ♀ fig. 12.

## Genus MELITAEA Fabr.

## (LEMONIAS Hbn.)

NEUMOEGEN'S CHECKER-SPOT *(Melitæa neumoegeni* Skin.) is a true child of the desert, delighting in the unpeopled expanses of the Mojave, and the arid regions of the Coachella and Imperial Valleys. It is also found in the Mono Basin.

The lustrous white markings of the under side of secondaries (exceeded only by *gabbii)* are characteristic of this species.

*Neumoegeni* is double-brooded in the Colorado Desert, the first brood appearing in March and April, and the second in September. On the higher plateaus it may be only single-brooded. Although it is considered something of a rarity, there are occasional seasons when it may be taken plentifully in favored localities.

Early Stages. Recorded in part by the author in the "Bulletin, Southern California Academy of Sciences," Vol. 22, p. 69.

Egg. Undescribed.

Caterpillar. When mature, the ground color is black, sparsely sprinkled with gray dots. There is a lateral band of a lighter shade, due to the enlargement of the gray punctate spots; also a fine median dorsal black line caused by the absence of these dots. There are nine rows of branching jet-black spines. The head is a glistening black, profusely covered with hair.

Chrysalis. Figure A38 obviates the necessity of a description. The color is black, profusely mottled with gray. Numerous papillae project from the abdominal segments, tipped with orange, and shaded anteriorly with black.

Larval food-plant. *Aster tortifolius.*

Illustrated. Plate 35. ♂ fig. 13; ♂ under side fig. 14; ♀ fig. 15.

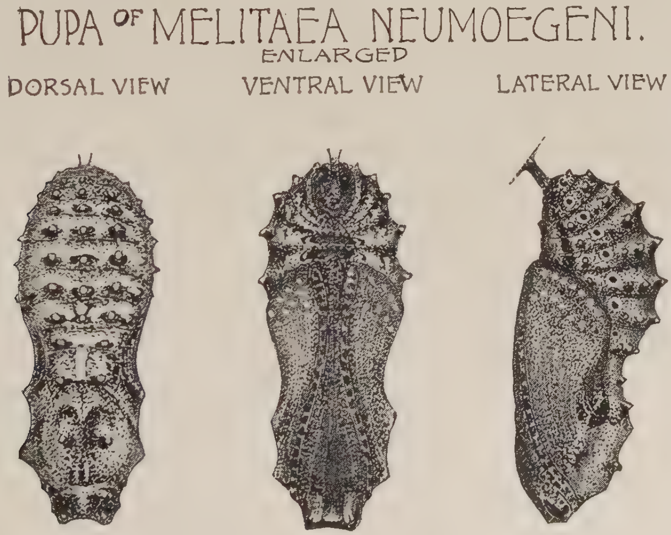


FIGURE A38

GABB'S CHECKER-SPOT *(Melitœa gabbii* Behr.) is a common insect in the canyons and foothills of the coast ranges, from the Monterey district to San Diego.

It may be distinguished from all other Checker-spots by the pearly lustre of the spots on under side of secondaries. March, April and May are its favored months of flight. Very rarely an abortive second brood appears in the summer.

Early Stages. No complete description is available. Coolidge has recorded the egg and first larval instar in the "Bulletin, Brookly Entomological Society," Vol. XIX, p. 46. Minot reports that the chrysalis is brownish, with spots on the wing cases.

Illustrated. Plate 36. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

NEWCOMB'S CHECKER-SPOT *(Melitœa gabbii* ab. *newcombi* Comst.) is an uncommon variant of *gabbii* in which the spots are reduced in size as a result of an increase in the black scaling. It is somewhat comparable to the form *eremita* in the *palla* group. A detailed description of the markings of both surfaces will be found in a subsequent chapter where the original description is reprinted.

Illustrated. Plate 36. ♀ (type) fig. 5.

GUNDER'S CHECKER-SPOT *(Melitœa gabbii* ab. *gunderi* Comst.) is another rare aberration of Gabb's Checker-spot. The colored figures will serve to differentiate this exceedingly melanic butterfly. This was originally described as a female, but a more careful examination shows it to be a male.

Illustrated. Plate 36. ♂ (type) fig. 6.

THE PASADENA CHECKER-SPOT *(Melitœa gabbii* ab. *pasadenœ* Gunder) is an albinic form of *gabbii.* All of the spots are a yellowish-white, instead of the usual yellow-brown. This gives a faded appearance to the butterfly, although it is actually a newly emerged specimen.

Illustrated. Plate 36. ♂ (type) fig. 4.

THE NORTHERN CHECKER-SPOT *(Melitœa palla* Bdv.) occurs over a vast area, stretching from the Sierra Madre Mountains of Southern California to British Columbia in the north, and east to the Rockies. It is characteristically a foothill and mountain species. The examples found at lower altitudes are of a light form, whereas higher elevations tend to enrich and darken the colors, giving us the race *whitneyi.*

The colored figures accurately picture this species. It will be noted that the spots on the under side of secondaries are of a rich cream color, lacking the lustre of the preceding species. The females are very different in aspect from the males, and frequently produce aberrant forms.

In low altitudes *palla* flies as early as April or May, but as one ascends its time of emergence is correspondingly retarded.

Early Stages. Incompletely described by Mead in the "Wheeler Survey."

Egg. Unknown.

Caterpillar. In the mature form dull black, with a double dorsal row of orange spots, interspersed with white patches. Two similar rows occur, laterally placed, with white areas in relation to the spiracles. The spiracles themselves are black.

Each segment bears five branching spines, the bases of which are surrounded by rings of dull white. A number of minute white points are irregularly scattered over the upper surface of the body. The head is small and glossy black.

Chrysalis. Fawn color, very faintly marked with pale brown dots and dashes. On the thorax are two raised shining points. Each segment, except the last, bears a triple row of small shining tubercles.

Larval food-plant. *Castilleia breviflora.*

Illustrated. Plate 36. ♂ fig. 13. ♂ under side fig. 14; ♀ fig. 15.

THE EREMITA CHECKER-SPOT *(Melitœa palla eremita* Wright) is a dimorphic form of the female of *palla* in which the black scaling is extended over a wider area of the wings, thus reducing the fulvous coloration. The yellow spots stand out in strong contrast to this dark background.

Illustrated. Plate 36. ♀ fig. 16; ♀ under side fig. 18.

THE STYGIAN CHECKER-SPOT *(Melitœa palla* ab. *stygiana* Comst.) is an example in which the darkening has been carried to an extreme, entirely obscuring the fulvous color and even reducing the size and number of the yellow spots. This rare aberrant female is at present known only from the type.

Intergrades occur between *stygiana* and *eremita* one of which is shown on Plate 36, fig. 17. These variant females may be looked for in any portion of the range of *palla.*

Illustrated. Plate 36. ♀ (type) fig. 19.

WARD'S ABERRANT CHECKER-SPOT *(Melitœa palla* ab. *wardi* Oberth.) represents a rare aberrational tendency in the male of *palla.* The illustration was reproduced from Dr. Oberthur's figure of the type, and shows both surfaces of the butterfly, the left hand portion representing the under surface.

Illustrated. Plate 37. ♂ fig. 2.

MALCOLM'S CHECKER-SPOT *(Melitœa malcolmi* Comst.) is an exceedingly rare alpine species, which is known only from the type series. These were captured by George Malcolm in the mountains above the Mammoth Lakes in Mono County.

Superficially this butterfly somewhat resembles *gabbii* on the upper side, but the ground color is of a duller shade, and of uniform type throughout the wing. There is also more of the black scaling, especially in the basal areas and along the inner margin of secondaries. On the under side the color is more that of *acastus. Malcolmi* flies in July.

Early Stages. Unknown.

Illustrated. Plate 36. ♂ (holotype) fig. 10; ♂ under side fig. 11; ♀ (allotype) fig. 12.

THE ACASTUS CHECKER-SPOT *(Melitœa acastus* Edw.) reaches its greatest development in the arid districts of Utah, but is found sparingly in the Mono Basin. It may also be looked for in the

Mojave Desert. The butterfly is a larger and lighter colored insect than *gabbii,* and the wings are more elongate. The under side of primaries shows a large clear area of yellow-fulvous, and the secondaries have less of the pearly lustre than is present in Gabb's Checker-Spot.

*Acastus* is an early insect, flying at its best in June.

Early Stages. Unknown.

Illustrated. Plate 36. ♂ fig. 7; ♂ under side fig. 8; ♀ fig. 9.

Jean Gunder has recently described an aberration of *acastus* which he calls *pearlæ.* Readers are referred to the "Entomological News" of January, 1926, for a diagnosis of this. It was named for Mrs. Pearl Malcolm, and the type was taken in the Casa Diablo Hills of Mono County. An excellent illustration occurs on Plate 1 of the publication above referred to.

WHITNEY'S CHECKER-SPOT *(Melitæa palla whitneyi* Behr) is an alpine race of *palla* which has assumed a richer and darker coloration in response to boreal influences.

The transition from *palla* to *whitneyi* is gradual, corresponding in general with the increase of altitude, hence every degree of intergradation will be found.

Illustrated. Plate 37. ♂ fig. 1; ♀ fig. 3.

HOFFMANN'S CHECKER-SPOT *(Melitæa hoffmanni* Behr) is a true denison of the highlands, where it is found in association with the Parnassians, and other upland dwellers. Its favorite haunts are the protected alpine valleys of the Sierras. Rather a shy insect, is *hoffmanni,* never occurring in great numbers. July is its favored month.

Early Stages. Unknown.

Illustrated. Plate 37. ♀ fig. 4; ♂ fig. 5; ♂ under side fig. 6.

THE ABNORMAL CHECKER-SPOT *(Melitœa hoffmanni* ab. *abnorma* Wright) is an aberration of the preceding species, the type of which was taken at Truckee. Only the one example, pictured by Wright, is at present known. The illustration was reproduced from Wright's colored figures.

ILLUSTRATED. Plate 37. ♀ under side fig. 7; ♀ fig. 8.

THE SEGREGATED CHECKER-SPOT *(Melitœa hoffmanni segregata* B & McD.) is a race of *hoffmanni* which is limited in range to the extreme northeastern portion of California and adjacent territory in Oregon. The types were taken at Crater Lake. As with the parent species, *segregata* prefers a mountain habitat, and is on the wing in July. It illustrates a tendency, which is common in the genus, for northern or high altitude races to assume a darker color.

ILLUSTRATED. Plate 37. ♂ fig. 9; ♀ fig. 10; ♂ under side fig. 11.

THE CHARA CHECKER-SPOT *(Melitœa chara* Edw.) is a diminutive gem of the arid regions. This dainty little butterfly ekes out a precarious existence in the deserts of southeastern California. Its favorite haunts are the canyons and gulleys of the Coachella and Imperial Valleys, where the red-flowering *Beloperone* occurs. Only in rare seasons of unusual rainfall is it to be found in any numbers. The species is double brooded, the spring generation flying in March and April, and the second brood in October.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 37. ♂ fig. 14; ♂ under side fig. 15; ♀ fig. 16.

THE SAN JACINTO CHECKER-SPOT *(Melitœa chara* ab. *jacintoi* Gunder) is a unique aberration of the foregoing species. The type was taken under the shadow of the noble mountain whose name it bears.

ILLUSTRATED. Plate 37. ♂ (type) fig. 12.

THE LUSTROUS CHECKER-SPOT *(Melitœa chara* ab. *nitela* Comst.) is another variant of *chara,* originally described by the author in the "Bulletin, Southern California Academy of Sciences," Vol. 25, p. 33. The left secondary in the colored figure shows a red suffusion which is not present in the original. Otherwise the picture is an accurate portrayal of the type. A detailed analysis of the upper surface is included in the reprint of the original description, in a supplemental chapter.

Illustrated. Plate 37. ♂ fig. 13.

THE LEANIRA CHECKER-SPOT *(Melitœa leanira* F. & F.) ranges in the coastal regions and sierran foothills, from approximately the central San Joaquin Valley region to the northern end of the state. This distinctive insect is found in isolated colonies, as are many of the Checker-spots, and is of rather infrequent occurrence. It is on the wing in the spring months, being more commonly encountered in May and June. Occasionally it occurs at moderate elevations in the mountains, and, as would be expected, flies later in the season. On the southern limits of its range there is a gradual increase in the red maculation, until, in southern California the race *wrightii* is developed.

Early Stages. Unknown, although the larval food-plant has been recorded as *Cordylanthus pilosus.*

Illustrated. Plate 37. ♂ fig. 17; ♂ under side fig. 18; ♀ fig. 19.

THE OBSOLETE CHECKER-SPOT *(Melitœa leanira obsoleta* Hy. Edw.) is a rare form of the above species which has been taken in a limited territory of Marin County. It differs from the typical insect principally in the absence of the punctate band crossing the under side of secondaries. Intermediate forms occur, one of which is shown on the colored plate.

Illustrated. Plate 37. ♂ under side fig. 21; intermediate form ♂ fig. 20.

THE LEONA CHECKER-SPOT *(Melitœa leanira* ab. *leona* Wright) is a rare variant of *leanira.* The colored illustration will serve to differentiate this, the principal feature being the arrangement of the lines and spots on the under side of secondaries. *Leona* is a great rarity.

Illustrated. Plate 38. ♀ under side fig. 1.

WRIGHT'S CHECKER-SPOT *(Melitæa leanira wrightii* Edw.) is the southern race of *leanira.* It occurs in restricted colonies throughout the foothills and lower mountains, where it seems to prefer open exposed hillsides. In the upper Mint Canyon, where there is an association of juniper, yucca and *Castilleia,* this strikingly marked butterfly is occasionally found in great numbers, but throughout the greater portion of its range is rather uncommon. May and June are its favored months, but examples are sometimes taken earlier and later than this.

Early Stages. Egg. Of characteristic *Melitæa* form, with fluted longitudinal ridges on the upper portion, and irregular depressions on the basal area. Of the other stages nothing is known. The writer has repeatedly searched for the larvæ in regions where *wrightii* abounds, but without success. Possibly the caterpillars are nocturnal feeders, and remain hidden through the daylight hours.

Illustrated. Plate 38. ♂ fig. 2; ♂ under side fig. 3; ♀ fig. 4.

THE CERRITA CHECKER-SPOT *(Melitæa leanira wrightii* ab. *cerrita* Wright) has arisen in all probability, as a result of semi-desert environmental influences. It is always found in association with *wrightii,* and occurs in every degree of intergradation between the typical insect and an extreme form more heavily suffused with brick-red than the typical *cerrita.* One of these intermediate examples is shown on fig. 5 of Plate 38. Needless to say, these aberrations are rare.

Illustrated. Plate 38. ♂ fig. 6 ; ♀ fig. 7.

A heavily suffused aberration of *wrightii* was recently described by Jean Gunder, under the name *carolynæ.* The reader is referred to the "Entomological News" of January, 1926, for a detailed description and illustration of this rarity.

THE ALMA CHECKER-SPOT *(Melitæa alma* Stkr.) has its locus in the arid lands of the Great Basin and the Mojave plateau. Its close relationship to the *leanira* group is shown by the aberration *cerrita,* which, in extreme individuals, so closely approximates *alma* as to be almost indistinguishable from it. This similarity has led Drs. Barnes and Benjamin to place *cerrita* as a synonym of *alma.* It must be noted, however, that in the territory of *alma* no examples occur that resemble *wrightii.*

In California *alma* is an exceedingly rare capture, but it is found in fair numbers at Pyramid Lake, Nevada, in the spring. This is a district of scant habitation, hence the butterfly will always be rare in collections.

Early Stages. Unknown.

Illustrated. Plate 38. ♂ fig. 8; ♀ fig. 9; ♂ under side fig. 10.

THE MONACHE CHECKER-SPOT *(Melitæa pola monache* Comst.) is a California race of *pola.* The parent species is an Arizona insect. *Monache* is at present known only from the types, which were taken by the author in the Monache Meadows of Tulare County. This is an isolated region west of Olancha Peak, reached only by difficult trails. A detailed description of this form is subsequently included. The types were taken in August. It is possible that *pola* may also reach California. If so, it will be found close to the Arizona line.

Early Stages. Undiscovered.

Illustrated. Plate 38. ♂ (holotype) fig. 11; ♀ (allotype) fig. 12; ♂ under side fig. 14.

## THE CRESCENT-SPOTS. Genus PHYCIODES Hbn.

THE PHAON CRESCENT *(Phyciodes phaon* Edw.) occurs sparingly in a limited territory from San Bernardino south and east to the border. Its home is in the Gulf states, and records for California represent the extreme western limits of its range.

This species is placed as *gorgone* Hbn. in the latest published list of Drs. Barnes and Benjamin, on the strength of Hubner's mixed type series (in which the male was of another species and the female was the particular insect under consideration.) If this designated female is accepted as the type, then *phaon* will fall as a synonym of *gorgone*. For the present we are retaining the more familiar title.

The strongly contrasted black, yellow and fulvous areas on the under side of wings, together with its small size, will serve to separate *phaon* from its nearest allies.

In California this butterfly is on the wing in July and August. It is figured as *tharos*, and *marcia*, by W. S. Wright.

Early Stages. Unknown.

Illustrated. Plate 39. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

THE FIELD CRESCENT *(Phyciodes campestris* Behr) is the common Crescent-spot of California, occurring in all parts of the state, except in the extreme desert or alpine regions. It delights in moist meadow lands, and the banks of mountain watercourses.

This is a species of medium size, and dark coloration of the upper surfaces. There are two broods in the lowlands. The first appears in April or May, and the second in August or September.

Wright figures this species as *orseis*.

Early Stages. Unrecorded.

Illustrated. Plate 39. ♂ fig. 4; ♀ fig. 5; ♂ under side fig. 6.

THE MOUNTAIN CRESCENT *(Phyciodes montana* Behr) has its home in the alpine regions, and ranges through the Sierras at an altitude in excess of 5,000 feet.

It may be differentiated by the clear fulvous area distal to the cell on the upper side of secondaries. There is some variation in this feature, however, occasional specimens showing less than the examples pictured in the plate.

*Montana* flies from late spring to mid-summer, and is probably double brooded.

Early Stages. Unknown.

Illustrated. Plate 39. ♂ fig. 7; ♀ fig. 8.

THE ORSEIS CRESCENT *(Phyciodes orseis* Edw.) is the largest member of the genus in this state. It is limited in range to a restricted area north of San Francisco, centering in the St. Helena range. The feature which distinguishes this butterfly is the scalloped outline of the secondaries. It is in flight from March to June, and is as yet quite rare in collections.

An interesting aberration of *orseis* is shown on Plate 39, figure 12.

Early Stages. Undiscovered. San Francisco entomologists should be able to solve this problem.

Illustrated. Plate 39. ♂ fig. 9; ♂ under side fig. 10; ♀ fig. 11; aberrant ♀ fig. 12.

THE MYLITTA CRESCENT *(Phyciodes mylitta* Edw.) flies in abundance throughout the West Coast. It is distributed from British Columbia to Mexico, and ranges east to the Rocky Mountains. Northern examples are larger and more heavily marked than are those from California.

*Mylitta* is noted for the reduction of the black areas, with a consequent increase in the amount of yellow-fulvous on the upper surfaces.

The species is double brooded, as are most of the Crescent-spots. The spring generation flies from April to early June, while the second brood is most plentiful in August and September. At high elevations it may be limited to a single summer brood. The aberration pictured on Plate 39, figure 16, shows an interesting tendency. This example was taken in the Sierra Madre Mountains of California. It is almost an exact counterpart of a race of *mylitta* occurring at Colorado Springs, which was named *barnesi* by Dr. Skinner; yet it was found in a territory hundreds of miles from the home of *barnesi.*

*Mylitta* occurs in much the same sort of environment as does *campestris*; in fact, most of the Crescent-spots choose moist and verdant areas.

Wright's figure 201b. is really the large northern form of this species, instead of *pratensis,* as he lists it.

Early Stages. Described in the "Wheeler Survey," and also given in some detail in the "Canadian Entomologist" of 1891, p. 203.

Egg. Unknown.

Caterpillar. Velvety-black, each segment provided with six branching spines, all of which are black except those of segments 4, 5 and 6. The latter are yellow. There is a faint twinned yellow dorsal line, and similar lines occur on the sides. The head is bronze-black, entirely covered with short black hair. The abdomen is yellowish, or it may have a fleshy tinge.

Chrysalis. Wood-brown to ashy-gray, with occasionally a slight metallic reflection. The dorsal region bears three rows of slightly raised tubercles. The anal extremity is much incurved.

Larval food-plant. Thistle.

Illustrated. Plate 39. ♂ fig. 13; ♂ under side fig. 14; ♀ fig. 15.

One other species of *Phyciodes* is doubtfully credited to California. This is *P. picta* Edw. The record is based on Edwards' description of *Phyciodes canace* from Southern California. Various authors have placed *canace* as a synonym of *picta,* which would, if Edwards' locality records are correct, include *picta* in our fauna. No authentic confirmation of the occurrence of this species in California has been made since Edwards' description was written.

## THE PATCHED BUTTERFLIES. Genus CHLOSYNE Butl.

THE BORDERED PATCH *(Chlosyne lacinia* Gey.) is a highly polymorphic butterfly, occurring within our fauna in a number of different aspects. The typical insect does not occur north of the Mexican line. The form which has usually gone by this name, and which is pictured as such on the colored plate, is probably *adjutrix* Scud. It is a common insect in Texas, and only occasionally appears in the Imperial Valley and adjacent desert districts of California.

It is multiple brooded, but is more frequently taken in the fall.

Early Stages. Described by Edwards in the "Canadian Entomologist," Vol. 25, p. 286.

Egg. Similar to that of *Phyciodes* and *Melitœa,* with the upper three-fifths ribbed, and the remaining lower portion pitted. The color is, at first, a pale green, later changing to yellowish. The eggs are laid in clusters.

Caterpillar. Spiny, and so variable in color as to be described with difficulty. The range is from a solid black to a reddish-fulvous, with a variety of stripes and blotches.

Chrysalis. Also variable, particularly as to the extent of the black streaks and markings, which are superimposed on an ivory-white background. The shape is quite similar to that of the *Melitœas.*

Larval food-plant. Sunflower.

Illustrated. Plate 39. ♂ fig. 17; ♂ under side fig. 18.

THE CROCALE PATCH *(Chlosyne lacinia crocale* Edw.) is a form of the above insect in which the orange-fulvous band on the upper surface is replaced by white.

Illustrated. Plate 39. ♀ fig. 19.

THE RUFESCENT PATCH *(Chlosyne lacinia rufescens* Edw.) represents another color form of *lacinia,* in which the upper surface of primaries shows little or no fulvous, the spots being white, while the secondaries retain the fulvous band.

Illustrated. Plate 39. ♂ fig. 20.

THE DUSKY PATCH *(Chlosyne lacinia nigrescens* Ckll.) is a form of *lacinia* in which the fulvous areas are entirely suppressed, and the white spots much reduced.

ILLUSTRATED. Plate 39. ♂ fig. 21.

In the above group, every sort of intergradation between the named forms will occur. As a study is made of this plastic species, in its extension into South America, with its numerous named varieties, it will be found that *lacinia* is one of the most inconstant species known to science.

THE CALIFORNIA PATCH *(Chlosyne californica* Wright) is one of the great rarities of the genus. This is probably due to the limited area which it inhabits, and the precarious existence it is forced to maintain in the inhospitable desert lands that constitute its home. Only in favored seasons, and in a few isolated canyons playing into the Colorado Desert and adjacent arid lands, is it to be found. It never appears in great numbers.

Two broods are recorded, one flying in March and April, the other in September or October.

Seitz treats *californica* as a form of *lacinia,* but its constancy, and isolated habitat establish it as a distinct species.

EARLY STAGES. Unknown, in spite of the fact that many lepidopterists have searched diligently for the larva. *Helianthus* seems not to occur in its district.

ILLUSTRATED. Plate 38. ♂ fig. 13; ♀ fig. 16; ♂ under side fig. 17.

THE CHINO PATCH *(Chlosyne californica* ab. *chinoi* Gunder) is a variant from the typical insect. It is so well pictured on the plate that a differential discription is unnecessary. The type was taken in Chino Canyon, for which it was named. This locality is a few miles northwest of Palm Springs in Riverside County. It has proven the most fertile collecting ground thus far discovered for *californica.* Intergrades between *chinoi* and the typical insect occur, one of which is shown in figure 18 of Plate 38.

ILLUSTRATED. Plate 38. ♀ fig. 15.

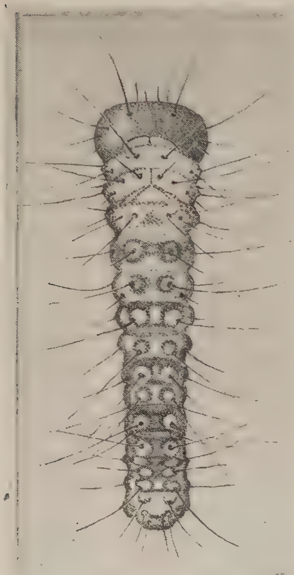
## THE ANGLE-WINGS. Genus POLYGONIA Hbn.

THE SATYR *(Polygonia satyrus* Edw.) occurs abundantly throughout the mountain states of the west. It frequents wooded districts where sufficient moisture is present to insure a growth of nettle. It may be distinguished from other members of the group by the light color of the upper surface, in combination with the mottled wood-brown of the under side.

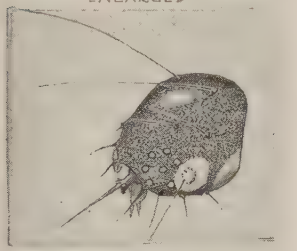
Not unlikely *satyrus* is multiple brooded, as captures are recorded from April to November. It is an agile insect, and may be more easily secured in good condition by rearing the caterpillars.

Early Stages. Egg. Delicate green. Illustrated in Figure A40a. The eggs are laid on the under side of the leaves, and frequently occur in strings of three or four, placed one on top of another.

Caterpillar. Described and illustrated in Edwards' first volume. The head is black and spiny with a branching tubercle at each of the upper angles. The body is black, with a broad greenish-white dorsal stripe, clouded anteriorly with black. This stripe has, on each segment, a V-shaped black mark. The spines form seven rows. Those of the dorsum, and the first lateral row are greenish-white.



DORSAL VIEW OF LARVA
ENLARGED



LATERAL VIEW OF HEAD
GREATLY ENLARGED

LARVA OF POLYGONIA SATYRUS
FIRST INSTAR.
FIGURE A39

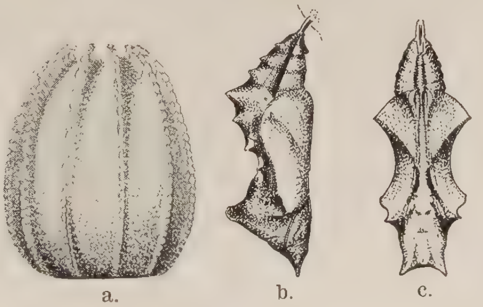


FIGURE A40

Early Stages of *Polygonia satyrus*

a. Egg, Greatly Magnified. b. Chrysalis, Lateral View. c. Same, Ventral View

The second lateral row are black, then follows another of greenish-white which is superimposed on a line of the same color. The newly emerged larva is shown on figure A39.

Chrysalis. Illustrated in Figure A40 and also in colors on Plate 63, fig. 13.

Larval food-plant. Nettle.

Illustrated. Plate 40. ♂ figs. 1 and 2; ♀ fig. 3; ♂ under side fig. 4.

THE MARSYAS ANGLE-WING *(Polygonia satyrus r*
Edw.) is a form of the preceding species, characterized by l
markings of the superior surface, and a soft, more or les
colorous dull-brown of the under side. Edwards, on the ba
Mead's experiments, contends that *satyrus* and *marsyas* are sea
forms, but Wright disputes this. California lepidopterists sl
be able to determine this by a series of careful breeding experim

Illustrated. Plate 40. ♂ fig. 5; ♀ fig. 6; ♂ under
fig. 7.

THE GOLDEN-WING *(Polygonia satyrus chrysoptera* Wrig
is a dimorphic female of *satyrus* in which the upper surface of t
secondaries is almost devoid of dark markings on the outer half. It is uncommon in comparison with the typical insect.

Illustrated. Plate 40. ♀ fig. 8.

THE RUSTIC ANGLE-WING *(Polygonia faunus rusticus* Edw.) occurs uncommonly in California, but has occasionally been taken in the mountainous districts of the northern half of the state. The parent species, *faunus*, reaches the West Coast only in the far north. *Rusticus* is distinguished by the heavily indented wings, the broad blackish-brown border of the upper side of secondaries with its row of enclosed round ferruginous spots, and the contrasting dark mottlings of the under side.

Early Stages. Described by Edwards in his Volume 2, where an excellent illustration of the larva and pupa occurs.

Egg. Undescribed.

Caterpillar. When mature, orange fulvous, with a white area on most of the dorsum, which is crossed by black and fulvous lines. The sides are variously mottled, and bear two longitudinal fulvous lines. The spines are of similar character to other members of the group; those in relation to the dorsal white area are of the same color. The others are of various shades.

Chrysalis. Glossy light brown or drab. The wing cases are clouded. Several metallic spots occur on the body, as with many other species.

Larval food-plant. *Azalea occidentalis.*

Illustrated. Plate 40. ♂ fig. 13; ♂ under side fig. 11.

THE COLORADO ANGLE-WING *(Polygonia hylas* Edw.) has been recorded for the extreme northern counties of the state. It is a great rarity on the West Coast, but is not uncommon in Colorado.

This species may be distinguished by its small size and purplish-gray under surfaces. The row of light submarginal spots of the upper side is in strong contrast to the remainder of the wing.

Early Stages. Unknown.

Illustrated. Plate 40. ♂ fig. 9; ♂ under side fig. 12.

THE ZEPHYR *(Polygonia zephyrus* Edw.) occurs throughout California, but is rather uncommon in the southern counties. It is partial to mountain districts.

On the upper side *zephyrus* is characterized by a light color, with a rather constant series of pale submarginal crescentic spots. The mottled gray or brownish-gray of the under surface will also help to separate it from other forms.

The Zephyr probably has a succession of broods, which accounts for captures recorded from May to September.

Early Stages. The larva and pupa are illustrated and described in detail by Edwards, in "Butterflies of North America." The egg is undescribed.

Caterpillar. Spiny, as with other members of the Genus. The body color is black. A dorsal line occurs, part of which is yellow, the remainder white. There is also a pale yellow medio-dorsal line. The lower spines are black, while the ones in the dorsal region are partly reddish, and the remainder white.

Chrysalis. Marbled with shades of salmon and olive. There are a few silver spots in the dorsal region.

Larval food-plants. Elm, azalea, rhododendron, gooseberry and currant.

Illustrated. Plate 41. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

THE SILENUS ANGLE-WING *(Polygonia oreas silenus* Edw.) is one of the uncommon members of the group, having its locus in the northwestern states, and only occasionally being recorded for California. It occurs in heavily timbered and well watered areas. Thus far it has not been reported south of the Santa Cruz Mountains.

The dark coloration of the under side and the acutely angled silver triangle on the secondaries are sufficient to distinguish this species.

EARLY STAGES. Undescribed.

ILLUSTRATED. Plate 41. ♂ fig. 4; ♀ fig. 5; ♂ under side fig. 6.

## THE TORTOISE-SHELLS. Genus AGLAIS Dal.

## (HAMADRYAS Hbn.)

THE CALIFORNIA TORTOISE-SHELL *(Aglais californica* Bdv.) is a common insect in the mountains, and is distributed over a wide area west of the Rockies. In certain seasons it appears in such tremendous numbers as to cause a complete defoliation of the wild lilac over extensive areas. When this occurs a swarming and migrating instinct seems to take possession of the butterflies and they travel for great distances. It is an interesting sight to witness one of these movements. The writer observed such a migration in the Tahoe region, some years ago. The flight was continuous for a period of three days, with the insects moving in a northerly direction throughout all of the daylight hours. More than fifty butterflies were taken with a single stroke of the net, at a point where they were passing between two bushy obstructions. This gives some conception of the numbers that are engaged in such a flight.

In the southern end of the state *californica* is limited to the higher mountains, and is uncommon, but in the northern counties it apparently flies at all altitudes.

The butterfly has two or more broods in a season. Early spring captures are probably of individuals that have passed the winter in hibernation, as is customary with members of this group.

EARLY STAGES. Described in part by Henry Edwards, in the "Proceedings of the California Academy of Sciences," Vol. 5, p. 171. The egg has not been recorded.

Caterpillar. When fully grown, a deep velvety black, bearing on each segment five branching spines. At the bases of these are bright steel-blue tubercles. Between the spines, particularly in the dorsal region, are a number of small white dots, from each of which springs a short whitish hair. At the base of the dorsal spines are bright yellow areas, which give the appearance of a yellow dorsal line.

Chrysalis. Ashy-gray, with a bluish efflorescence; the abdomen fawn colored. The head bears two sharp blackish processes. The thorax is mottled with brownish, and bears two angular spines near the junction of the wing cases. There are a number of black points on the abdomen, as with others of the genus.

Larval food-plant. *Ceanothus.*

Illustrated. Plate 41. ♂ fig. 7; ♂ under side fig. 8.

MILBERT'S TORTOISE-SHELL *(Aglais milberti* Godt.) is an uncommon capture in California. It occurs in all of the mountain ranges, usually at high elevations, but occasionally makes excursions into the lowlands. Like the foregoing species, it is double or triple brooded, and probably has the same habit of overwintering as an imago.

Early Stages. Recorded by numerous writers, notably W. H. Edwards in the "Canadian Entomologist," Vol. 17, p. 181.

Egg. Conical, the base flattened and the top rounded. Eight or nine vertical ribs are present, more clearly defined at the upper portion. Between these, fine horizontal striations occur. The color is green.

Caterpillar. When mature, larva nearly black above, and bearing a greenish-yellow lateral line, and a subdorsal stripe of bright orange. Covered sparingly with small white dots, from which pale hairs arise. The usual branching spines are present. All the markings are somewhat variable.

Chrysalis. This bears processes somewhat after the manner of *antiopa.* The color is highly variable, ranging from a soiled white to blackish, with more or less bronzing on various portions. The wing cases are paler than the remainder of the body.

Larval food-plants. Nettle preferred, but larvæ have been found on willow and sunflower.

Illustrated. Plate 41. ♂ fig. 10; ♂ under side fig. 9.

COCKERELL'S TORTOISE-SHELL *(Aglais milberti subpallida* Ckll.) is merely a form of *milberti*, in which a light yellow or whitish color predominates on the fulvous band, next to the inner margin. This is the type of coloration on most examples occurring in the southern portion of the state.

Illustrated. Plate 41. ♂ fig. 11.

THE MOURNING-CLOAK *(Aglais antiopa* L.) is common in California, as it is in every other portion of the Temperate Zone. It is a familiar insect to all who have had an interest in nature, and never fails to arouse admiration on account of its brilliant coloration and boldness of pattern.

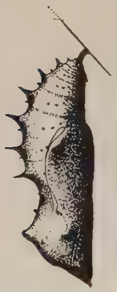


FIGURE A41
Chrysalis of
*Aglais antiopa*

*Antiopa* is found at all altitudes, and in every season.

Early Stages. Too familiar to need description. The spiny black caterpillars are found in great numbers on a variety of food-plants, such as willow, elm, poplar and cottonwood. Figure A41 pictures the chrysalis. It is also shown in colors on Plate 63, fig. 3.

Illustrated. Plate 42. ♂ fig. 2; ♂ under side fig. 1.

THE BROAD-BORDERED MOURNING-CLOAK *(Aglais antiopa* ab. *hygiaea* Heydenr.) represents an interesting aberration of *antiopa* in which the yellow border encroaches on the middle portion of the wing, obliterating the blue submarginal spots. It is a great rarity, in spite of the commonness of the parent species.

Illustrated. Plate 42. ♂ fig. 3; ♂ under side fig. 5.

EHRMANN'S ABERRANT MOURNING-CLOAK *(Aglais antiopa* ab. *grandis* Ehr.) is another variant of the Mourning-cloak, which differs from the typical insect only in the absence of the line of blue spots.

There are two named aberrants of this common insect in addition to the varieties here treated, but they are rare, and as yet unrecorded for the West Coast.

Illustrated. Plate 42. ♂ fig. 4.

## BUTTERFLY MIGRATION

The occurrence of great swarms of butterflies has frequently been noted in many parts of North America. Year after year we receive accounts of gatherings of these interesting insects during the fall months. Newspaper reporters and amateur naturalists noting these occurrences frequently break into print with accounts of their "new discoveries" of butterfly swarms, and our museums are called upon annually to explain the phenomena.

Migrations of this sort are of one particular species, the Monarch *(Danaus menippe)*. This is the only North American species that could be said to truly migrate. It seems that the movement of butterflies in the fall is toward the south, and in the spring in the reverse direction. This butterfly belongs to a genus that is adapted to a tropical environment. It does not have the power of maintaining itself in any of its stages throughout the winter in temperate or boreal climates. A swarming instinct seems to take hold of the butterflies that are on the wing in the fall throughout the United States and Canada. This causes them to gather in immense aggregations, frequently of such extent as to darken the sky. In the course of their southward progress they tend to follow certain definite pathways, which are probably related in some way to water courses or coast lines. It is thus noted that certain trees or groves of trees in various parts of the country furnish annually a resting place for the butterflies. These trees come to be designated "butterfly trees." We have on the west coast a number of localities in which such groves of trees are located. A particularly noted "resting station" is located at Monterey, where a grove of Eucalyptus is visited annually by the southward moving swarms. A grove of similar character is located at Santa Monica.

It is difficult to account for this migrating instinct on the part of butterflies, particularly in view of the fact that only certain broods in a given year take part in the migration. This butterfly is polygoneutic, or, in other words, produces several generations in a year. Only the fall brood enters into this general southward movement and a totally different generation, that of the early spring brood, moves in a northerly direction. The southward movement is the only one that occurs in association with a swarming instinct. Thus we see these great clouds of butterflies only in the late autumn.

The northward spring movement is of quite a different character. The butterflies are noted in February, March, and April traveling singly and in a leisurely manner. Their course of flight is generally in a northerly direction, but frequently individuals are seen traveling toward the east or the west. They probably advance with about the same rate of movement as that of the oncoming spring season.

Much work remains to be done in order to determine the progress of these migrations and the pathways which they follow. It would be of interest for entomologists to establish a butterfly banding campaign much as the ornithologists have done with birds.

A very different type of migration occurs with a number of species of North American butterflies, one of which was noted in California in the early part of 1924. This is not in any sense the equivalent of the migration of the Monarch. It occurs in butterflies that have the power of over-wintering in the northern states, either as imagos or crysalids. It is not the response to an instinct that prompts a southward movement in the fall for the purpose of over-wintering in favorable environment, but rather is determined by the scarcity of food-plant, and perhaps to some extent by the sudden subsidence of the several parasites. It is not an annual occurrence, but is noted at rather infrequent intervals.

A number of species have been recorded in this type of migration among which may be mentioned the Painted Lady *(V. cardui)*, the West Coast Lady *(V. carye)*, the California Tortoise Shell *(Aglais californica)*, and the Snout butterfly *(Libythea bachmanni)*. The first named species is the one that formed our spring migration of 1924. This is one of the most extensive migrations ever noted for this butterfly. It covered a territory extending from our southern coast as far east as Southern Colorado. It probably had its chief point of origin in northern Mexico. Some effort was made by our local naturalists to determine certain factors in relation to this migration. A number of lepidopterists collected larvæ and bred them for the purpose of determining the percentage of parasitism. The writer carried through over one thousand specimens of larvæ to the final stage and determined that about two per cent of the crysalids were parasitized.

It would be interesting to note the gradual increase in percentage of this parasitism. As the subsequent generations are produced undoubtedly there is a gradual increase of parasites tending to normalize the ratio of production. Another interesting fact that should be worked out in connection with this butterfly and its near relatives is the percentage of aberrant forms produced. The genus *Vanessa* is remarkable in the fact that all four species tend to produce aberrations of a type that is similar in general maculation. This would seem to suggest the prototype—in other words the ancestral species from which all four were originally derived. It would require a series of experiments carried on over many years in order to secure light on this factor. In the case of our experimentation we noted that only one aberration was produced in more than one thousand specimens that were reared.

The Painted Lady feeds upon members of the Malva and Thistle family. The swarms of caterpillars that were produced by the 1924 northern migration seem to have cleaned every trace of their chosen food-plants from our district. Undoubtedly the butterflies hatching in the subsequent generation were compelled to move in a northerly direction, in order to find sufficient food-plant for their offspring. One interesting fact that was noted was that after they had disposed of all of the available cheese-weed, hollyhock, thistle and related plants they then turned their attention to a number of other genera which do not generally or normally constitute their food. Reports have been published of a certain amount of damage to gardens and cultivated fields as a result of this infestation. It is to be hoped that observers will make particular note of all the plants that were thus infested. Generally speaking, however, the fears that were expressed by numerous writers that the caterpillars of this swarming generation would turn into "army worms" and infest our cultivated fields was without foundation. The "army worm" is the larva of a more or less omnivorous noctuid moth. This moth is unusually destructive to vegetation, whereas the larva of the Painted Lady may be generally classed as a mildly beneficial species since the majority of its food-plants are weeds.

One of the interesting migrators of this class is the California Tortoise Shell, *(Aglais californica)*. The caterpillar of this butterfly feeds upon the California wild lilac *(Ceanothus)*. When conditions are right for the production of swarms of this butterfly it is noted that the Ceanothus bushes are entirely defoliated over great stretches of territory in our mountains. The butterflies are compelled to move on to other districts in order to find sufficient food-plant on which to lay their eggs. We do not know the factors that determine the direction of this movement. Possibly it is related to the prevailing direction of the wind since it is easier for butterflies to fly against the wind than with it. Only in the case of wind storms do we find butterflies traveling with the wind to any extent.

The Monarch butterfly differs from all other North American migrating species in the fact that it is a protected form. It belongs to a genus that has worked out a chemical adaptation so that we find that the Danaids generally are not used as food by insectivorous birds. It is also very powerful-winged and is capable of long sustained flight. These factors tend to fit the species more perfectly for migration than in the case of the other species which do not belong to a protected group and are relatively short lived.

The elucidation of the factors entering into butterfly migrations should receive increasing attention from lepidopterists, and as the interest in this study grows we hope gradually to clear up the unknown points in connection with this interesting subject.

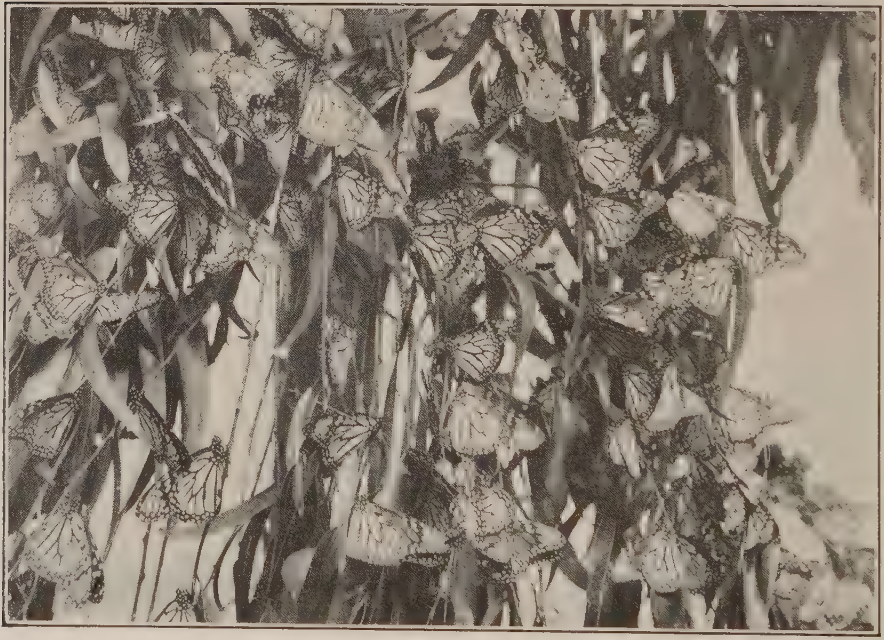


PLATE C

A GROUP OF MONARCH BUTTERFLIES AT REST DURING THE COURSE OF A MIGRATION. PHOTO, COURTESY OF THE SAN DIEGO MUSEUM OF NATURAL HISTORY.

## THE PAINTED LADIES AND ALLIES. Genus VANESSA Fabr. (CYNTHIA Fabr. PYRAMEIS Dbldy.)

THE ALDERMAN BUTTERFLY *(Vanessa atalanta* L.) usually goes under the name of Red Admiral, but the author has chosen an old English designation in order to avoid confusion with the true Admirals of the Genus *Basilarchia*. *Atalanta's* bold colors are suggestive of the ancient aldermanic costume that was in vogue in the British Isles when men first began to note and record the various animals and insects.

*Atalanta* is a widely distributed and common insect, occurring throughout Northern Asia and Africa, Europe and North America. It is also found in Haiti, and has been introduced into New Zealand. In our own state it occurs at all altitudes, and is on the wing throughout the greater portion of the year.

EARLY STAGES. Described by numerous writers. The larva and pupa are figured in Holland's "Butterfly Book."

Egg. Of the usual barrel-shaped form, with from nine to ten thin high vertical ribs. The color is a delicate pale green.

Caterpillar. Covered with numerous branching spines. The prevailing color is black, and the body is studded with velvety points. The larva has the interesting habit of drawing the edges of a leaf together with silken threads, thus building for itself a protecting tent.

Chrysalis. In form, this somewhat resembles the pupa of *cardui*. It is usually gray, with the dorsal tubercles gilded. See Plate 63, fig. 5.

Larval food-plants. Hop, *Boehmeria*, and nettle.

ILLUSTRATED. Plate 43. ♂ fig. 1; ♂ under side fig. 2.

EDWARDS' PAINTED LADY *(Vanessa atalanta* ab. *edwardsi* Grin.) is believed by several writers to represent a hybridization of *atalanta* and *cardui*. If this is the case, it represents one of the few instances on record in which two distinct species of butterflies have interbred in a state of nature, with resultant progeny.

The illustration (figure 4) is made from Grinnell's type, lent through the courtesy of J. E. Cottle, of San Francisco.

*Edwardsi* is a great rarity. It is hoped that experimentors will endeavor to cross the two species above named, in an effort to produce it under artificial conditions.

ILLUSTRATED. Plate 43. ♂ fig. 4; ♂ under side fig. 7.

THE VIRGINIA LADY *(Vanessa virginiensis* Dru.) is another common member of this cosmopolitan group, which is widely distributed over the North American continent. It is easily separated from its nearest relative, *cardui*, by the rounded secondaries, and the two large ocelli on the under side of hind wings.

*Virginiensis* is not as abundant in California as are the other members of the Genus, although it occurs at all elevations, and flies throughout the greater portion of the year.

Early Stages. Illustrated in Holland's "Butterfly Book," and discussed by numerous writers.

Egg. Of the characteristic barrel-shaped type, with thirteen to sixteen vertical ribs, and a yellowish-green color.

Caterpillar. When fully grown, similar to the larva of *cardui*, except that it has, on each side, a row of round silvery-white spots; (one to every segment) on the posterior half of the body.

Chrysalis. Also resembles the equivalent stage in *cardui*, but the tubercles are orange-tipped.

Larval food-plants. Cudweed, burdock, western mugwort and everlasting *(Antennaria.)*.

Illustrated. Plate 43. ♂ fig. 3; ♀ under side fig. 6.

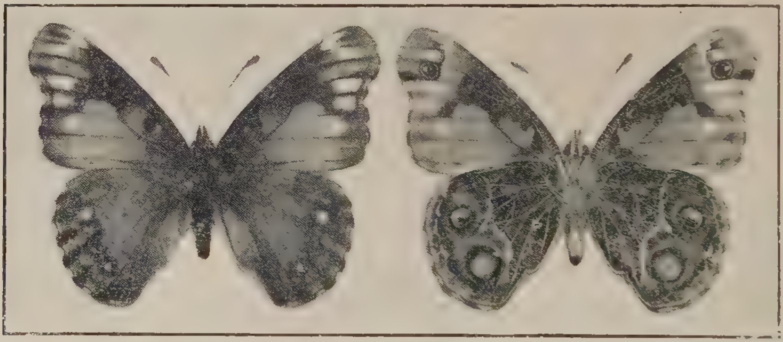


PLATE D

Representing an Unnamed Aberration of *Vanessa virginiensis*

DODGE'S ABERRANT LADY *(Vanessa virginiensis* ab. *fulvia* Dodge) is a lightly marked aberration of the above insect. The principal variation of this form from the normal is in the suppression of the dark area at the apex of the forewings. The type of *fulvia* was lent for this illustration by E. A. Dodge, of Santa Cruz.

Illustrated. Plate 42. ♂ fig. 9.

FOX'S ABERRANT LADY *(Vanessa virgiensis* ab. *ahwashtee* C. L. Fox) is a variant of the Virginia Lady in which a large amount of white suffusion on the under side has replaced the mottled areas of the typical form. The illustration of this unique example was drawn from the type by R. F. Sternitzky, of San Francisco. The right half of the figure represents the under side. It was named for a tribe of California Indians.

ILLUSTRATED. Plate 42. Fig. 6.

GUNDER'S ABERRANT LADY *(Vanessa virginiensis* ab. *massachusettensis* Gunder) is another unique aberrant of the Virginia Lady. It is pictured from Gunder's type. Only the one example from Massachusetts is thus far known, but it is here illustrated in the hope that others may subsequently be taken in California.

ILLUSTRATED. Plate 43. ♂ fig. 5.

THE PAINTED LADY *(Vanessa cardui* L.) may be counted the most universally distributed butterfly in the world. Wherever thistles grow this speckled beauty, or one of its geographic races abounds.

*Cardui* is one of the species which occasionally occurs in migrating swarms, and in such seasons it is present in countless millions. Ordinarily, however, it is less abundant in California than is the closely related *carye.*

EARLY STAGES. Described by innumerable writers. Illustrations of the larvæ and pupæ occur in most of the standard works on American and European butterflies.

Egg. Barrel-shaped; a third higher than broad, and bearing fourteen to nineteen thin and high vertical ribs, similar in character to those of *Polygonia satyrus* which are illustrated in Figure A40a. Color, pale green.

Caterpillar. The general body color is a delicate lilac. Between the joints are two lines of bright yellow. Internal thereto are a pair of black lines, and one of white. The spines are borne on seven rows of tubercles. Black spots are scattered over the body.

Chrysalis. Pictured in Figure A42, and also shown in colors on Plate 63, fig. 6.

Larval food-plants. Thistle, nettle, mallow of various species, bugloss, hollyhock, burdock, cocklebur, and occasionally sunflower.

In seasons of abundance, when the plants of choice are consumed, the caterpillars have been known to migrate and attack cultivated plants, such as soybean, alfalfa, lettuce, radishes, potatoes and beets. This is a rare occurrence, however.

ILLUSTRATED. Plate 43. ♂ fig. 9; ♂ under side fig. 8.

THE SUFFUSED LADY *(Vanessa cardui* ab. *elymi* Ramb.) is an aberrant form of the Painted Lady, which is of unusual interest to the student of genetics. It is believed by some writers that *elymi* is an atavistic form, or in other words, is suggestive of a prototype of the group. Three species of the genus have aberrants which show the same type of maculation, namely *cardui, carye* and *virginiensis.*

ILLUSTRATED. Plate 42. ♂ fig. 8. On this same plate is shown a specimen (fig. 7) which has only a slight aberrational tendency on the secondaries. This example was raised with a group of over a thousand larvæ. All of these caterpillars were cared for in a uniform manner, each one being subjected to the same environmental influences. Of the entire lot, this was the only individual which showed a variation from the normal type.

THE WEST COAST LADY *(Vanessa carye* Hbn.) dominates the genus on the west coast. It ranges from Vancouver Island to Patagonia, and, in the United States, extends eastward to Utah. It may be distinguished from its nearest ally, *cardui,* by its duller color, less pointed wings, smaller size, and the complete black band which crosses the cell primaries.

*Carye* occurs at all altitudes in California, and seems to breed continuously throughout the year, except for a month or two in winter. The butterflies are intrigued by the flowers of Lantana, and are easily captured while feeding. Their larvæ may be found in great numbers on the common cheese-weed or mallow.

EARLY STAGES. These are recorded by numerous writers. Dr. Dyar has given many details in the "Canadian Entomologist," Vol. 21, p. 237, and Karl Coolidge goes into minutiae, describing the egg, in the "Bulletin, Brooklyn Entomological Society," Vol. 20, June, 1925.

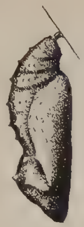


FIGURE A42

Chrysalis of *Vanessa carye*

Caterpillar. When fully grown, blackish, with numerous orange blotches, which are concentrated in the dorsal and lateral regions, so as to appear as interrupted lines. There are a number of fine whitish hairs scattered in various regions. The spines are black, and arise from glistening black tubercles. There is considerable variation in individuals.

Chrysalis. Pictured in Figure A42 and also shown in colors on Plate 63, fig. 9.

Larval food-plants. The chosen species belong to the *Malvaceae*, but caterpillars have been found on nettle, tree lupine and California privet.

Illustrated. Plate 44. ♂ fig. 1; ♀ under side fig. 2. An albinic form of the ♀ is shown on fig. 3 of the same plate.

GRINNELL'S BUTTERFLY *(Vanessa carye* ab. *intermedia* Grin.) represents an aberration of moderate degree. The only noticeable variation of this insect from the normal is in the absence of certain black bars crossing the posterior half of primaries. Fig. 4 of Plate 44 shows Grinnell's type, which was taken in San Francisco and was lent by J. E. Cottle.

Illustrated. Plate 44. ♀ fig. 4.

MUELLER'S BUTTERFLY (*Vanessa carye* ab. *muelleri* Letch.) represents another and more advanced stage in the aberrational pattern which finds its extreme expression in *V. letcheri*. *Muelleri* has the costal areas more heavily shaded with black, and the absence of bars on the posterior half of primary. Its distinguishing feature lies in the white spots centering in the ocelli on the secondaries, and the heavy shading of the basal half of the same wing.

Illustrated. Plate 44. ♂ fig. 6; ♂ under side fig. 5.

LETCHER'S BUTTERFLY *(Vanessa carye* ab. *letcheri* Grin.) is the extreme degree to which this aberrational tendency is carried. The two forms above described are merely transitional stages. *Letcheri* corresponds to *elymi* in the *cardui* series, and to the unnamed form of *virginiensis*, which is shown on Plate D, p. 132. Thus we have three distinct species producing a similar type of aberration. This, as previously stated, has led some authorities to believe that we are dealing with a case of atavism.

All of the aberrations above referred to are rare. When first recorded they were considered seasonal forms, but this has since been disproven.

The reproduction of *letcheri* was made from the type.

Illustrated. Plate 44. ♂ (type) fig. 7; ♂ under side fig. 8.

## THE PEACOCK BUTTERFLIES OR BUCKEYES

### Genus JUNONIA Hbn.

THE BUCKEYE *(Junonia coenia* Hbn.) is one of the most strikingly marked butterflies of North America, on account of the eye-like spots (ocelli). The upper surfaces show little variation, but on the under side there is a wide range of pattern and color.

*Coenia* is a pugnacious insect, spending much of its time darting out on passing butterflies in a manner that suggests an effort to start a fight. It is a dweller in the lowlands, seldom ascending beyond the foothill canyons.

There are two or more broods a year, and captures are recorded from March to November.

This beautiful species occurs throughout California, and ranges as far south as Columbia. It is also common in the southeastern states, and along the Gulf of Mexico.

Early Stages. Egg. Resembles somewhat the egg of the previously described *carye,* but is broader than it is high. It is a dark green.

Caterpillar. Dark in color, with longitudinal body stripes of pale yellow, and branching spines. Two of these are on the head, and point in a forward direction.

Chrysalis. Strongly arched on the dorsum, and concave on the ventral surface. The usual type is a pale wood-brown, with variously colored mottlings.

Larval food-plants. Plantain, stonecrop, snapdragon, *Passiflora, Gerardia* and *Mimulus.*

Illustrated. Plate 44. ♂ fig. 9; ♀ under side fig. 10.

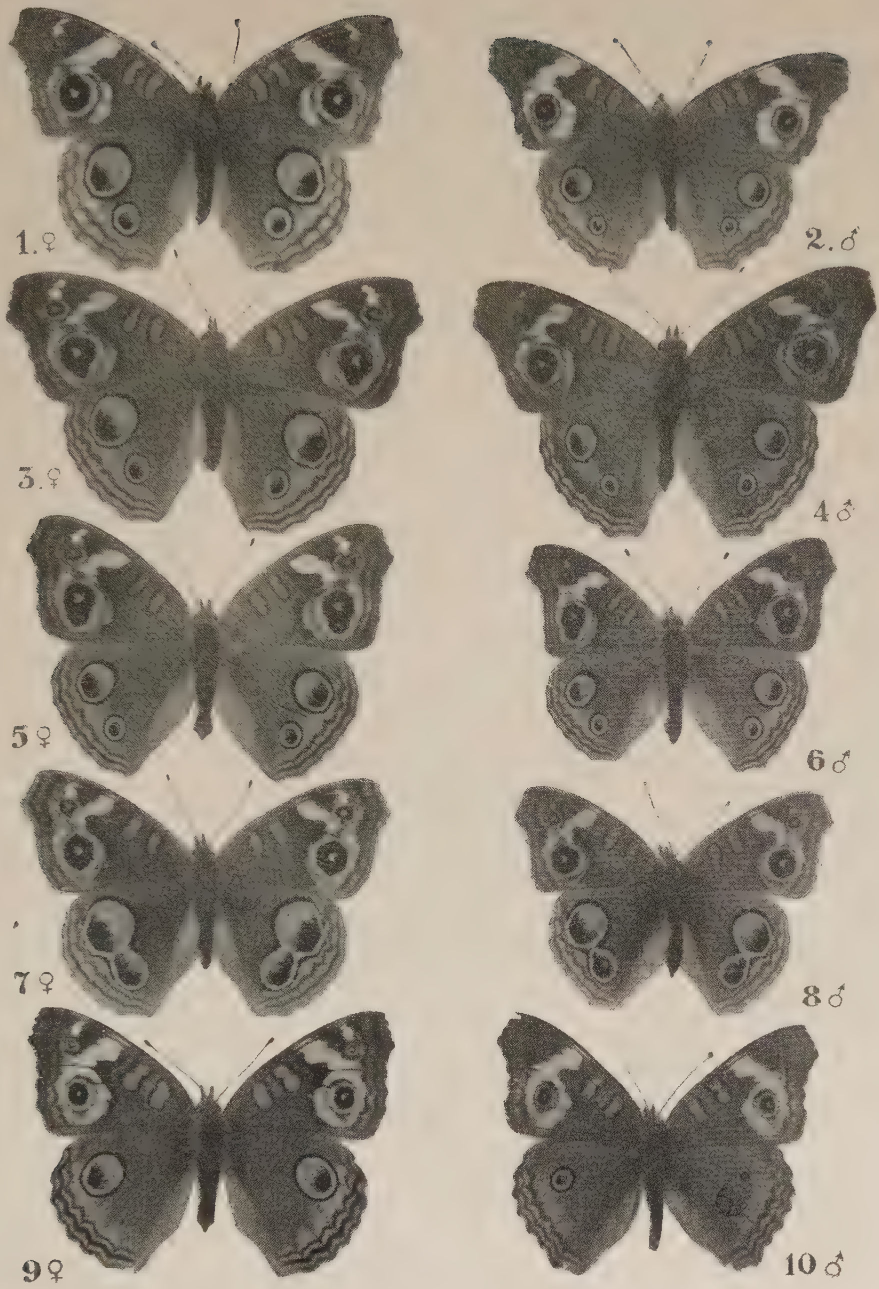


PLATE E

Specimens of *Junonia coenia*

Inbred Through Successive Generations, and Showing Numerous Modifications in Maculation and Color

SCHRADER'S ABERRANT BUCKEYE *(Junonia coenia* ab. *schraderi* Gunder) is a dark and much suffused aberration that was produced in the course of certain experiments which were being carried on by Mr. Wilhelm Schrader, of Los Angeles. Mr. Gunder's type is figured in the plate. It is not markedly different from *nigrosuffusa.*

ILLUSTRATED. Plate 43. ♀ fig. 10.

THE MELANIC BUCKEYE *(Junonia coenia nigrosuffusa* B. & McD.) is a southern Arizona race of *coenia* in which a black suffusion covers all of the superior wing surfaces. It is shown here for purposes of comparison, as there are, at present, no records of its occurrence in California.

ILLUSTRATED. Plate 44. ♂ fig. 11. Plate 43. ♂ under side fig. 11.

## SELECTIVE BREEDING OF BUTTERFLIES

The western butterflies present many problems that will require careful breeding, under controlled environments, before they can be solved. This is especially true of the Argynnids, and certain groups of Lycaenids in which the relationship of a number of forms is much involved.

If it were possible to direct the mating of butterflies as it is the cross-fertilizing of plants, this sort of experimentation would be an easy matter. But as it stands, these insects are exceedingly difficult to control in captivity. Many species refuse to mate or oviposit except in their native environment. A large number are so short lived as imagos that it is impossible to rear different strains to maturity so as to have males and females emerging at the proper time.

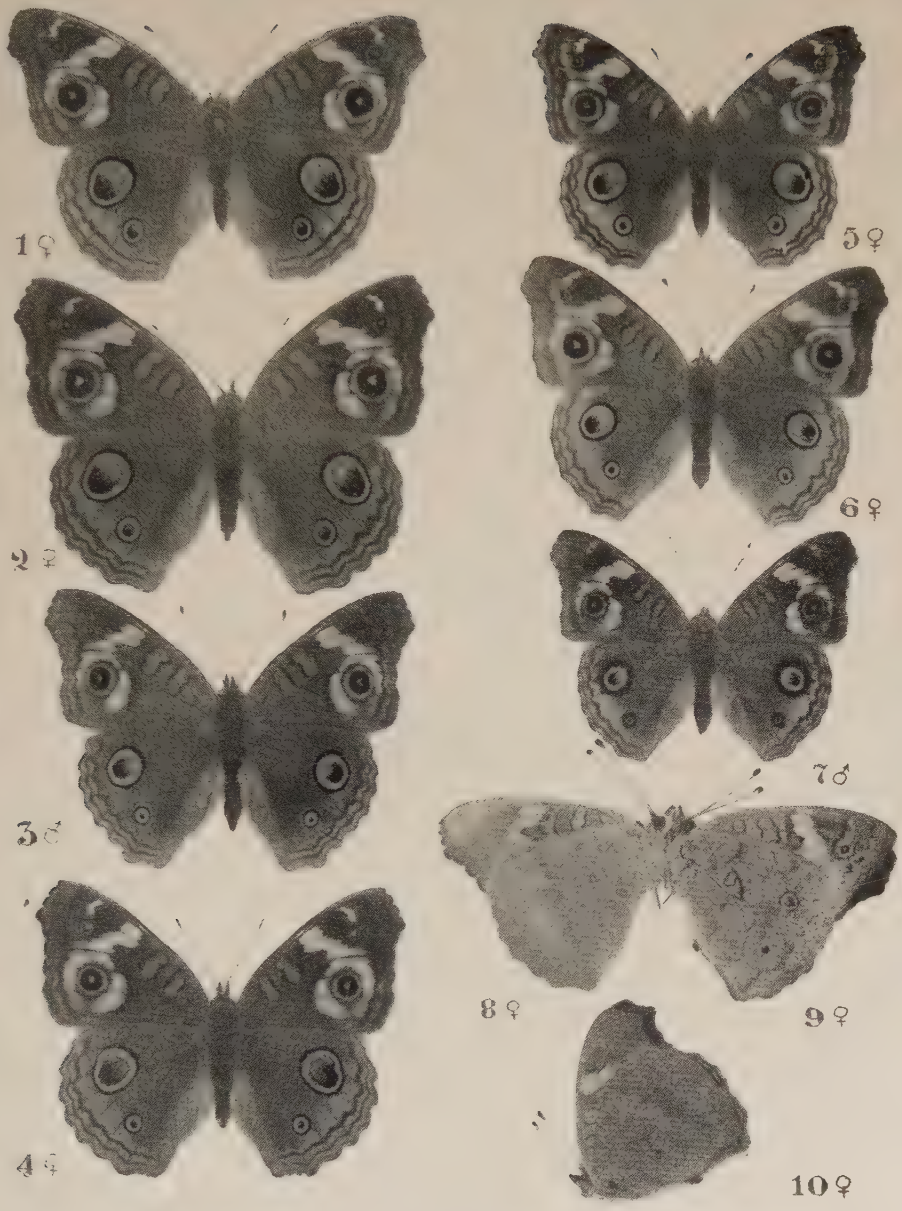


PLATE F
SPECIMENS OF *Junonia coenia*
INBRED THROUGH SUCCESSIVE GENERATIONS, AND SHOWING MODIFICATIONS IN MACULATION AND COLOR

It is almost impossible to create, artificially, the proper environment for a given species. The elements of temperature, humidity, sunlight, food-plant, and protection from parasites have all to be considered.

A number of European entomologists have subjected butterflies and moths to various kinds of experimental breeding, with rather startling results, but very little work of this character has been done in the United States.

Mr. Wilhelm Schrader, of Los Angeles, has for a number of years, been carrying on experiments in the selective breeding of butterflies. His published records, printed in the Pomona Journal of Zoology and Entomology, and the Bulletin of the Southern California Academy of Sciences, are well worthy of careful perusal by the student.

A number of examples of *Junonia coenia,* bred under a variety of conditions by Mr. Schrader are shown on Plates E and F.

Conclusions regarding these experiments may be summarized in the following statements:

The crossing of unrelated species of butterflies is practically impossible, on account of the difference in the structure of the genitalia.

Inbreeding of a single species produces the best results. This consists in raising the progeny of a single gravid female, and repeatedly mating selected pairs.

Color changes can be gradually brought about by selecting from each successive generation those examples having the specially desired qualities, and inbreeding therefrom.

Rearing the caterpillars in moist, warm air chambers tends to produce a darker ground color, and an enlargement of the spots. This tendency increases with each successive generation.

Striking changes, in the nature of aberrant features, can be produced by removing young caterpillars of a strain that has been reared for several generations in warm, moist air, to a cool environment. When the butterflies emerge they frequently have large, confluent ocelli. This change does not occur if the chrysalids alone are subjected to the lowered temperature.

A dry and warm environment tends to produce a lighter coloration, and a reduction in the size of the spots. This tendency can be demonstrated more readily if young caterpillars, taken from a stock that has been reared through several generations in moist air are used.

Chrysalids, when subjected to strong sunlight for a period of two hours each day, produce butterflies with darkened ground color and black borders surrounding the ocelli.

A reference to the figures on Plates E and F will further demonstrate the above conclusions.

Plate E.

Figures 1 ♀ and 2 ♂ show the normal *Junonia coenia,* captured in the open. The progeny represent the first generation.

Figures 3 ♀ and 4 ♂ represent the tenth generation of inbred specimens that were reared in the warm, moist chamber. Note the enlargement of ocelli on forewing.

Figures 5 ♀ and 6 ♂ represent the twenty-fifth generation, bred in the warm, moist chamber. Note the double ocelli on forewing.

Figures 7 ♀ and 8 ♂ are the progeny resulting from the transference of young caterpillars of the twenty-fifth inbred generation in warm, moist air, to a cold environment. Note the enlarged, confluent ocelli of the secondaries.

Figures 9 ♀ and 10 ♂ are the result of subjection to dry air. The caterpillars were selected from the inbred stock which had been reared in prolonged moisture and warmth. They were carried through to maturity in an electrically heated dry incubator. Note the reduction in the size and number of the ocelli.

Plate F.

Figure 1 ♀ is a *Junonia* captured in the open, and of the normal form, except for its slightly larger size.

Figures 2 ♀ and 3 ♂ were progeny of the first generation, which showed an unusual increase in size, and the presence of a purplish irridescence near the costal margin and around the orange colored bars of the forewing. These were paired.

Figure 4 ♀ resulted from the eleventh generation bred from the above stock, in which examples were selected which showed an increase in the purplish irridescence. This color, which does not show on the half-tone, was markedly increased.

Figure 5 ♀ is of the first generation, raised in the dry incubator, and which showed an increase in the yellow coloration.

Figure 6 ♀ shows the second generation of the above stock, selectively bred for an increase of the yellow, in warm, dry air. The yellowing is markedly increased.

Figure 7 ♂ is an example selected from the stock in which the yellow coloration was being increased. The chrysalis was subjected to direct sunlight for two hours daily. Note the effect, in the darkening of the ground color, and the black shading surrounding the ocelli on secondaries.

Figures 8 ♀, 9 ♀ and 10 ♀ are all the result of inbreeding from a single strain, under varying conditions. They demonstrate the changes which are brought about in the coloration of the under side of the wings. Figure 8 is of the third generation reared in dry air with increased temperatures. The under surface is a uniform gray color. Figure 9 resulted from a moist, dark environment. The color is variegated, with strong contrasts. Figure 10 was selected from the stock raised in lowered temperatures. The under surface is a purplish-brown.

Repetition of these experiments invariably produces the same results.

The painstaking work of Mr. Schrader has led to the elucidation of some of the factors responsible for the wide variation in the color and maculation of *Junonia coenia*, under varying climatic and geographic environments. It is hoped that other entomologists will be encouraged by these results toward carrying on experiments with other species.

## THE ADMIRALS. Genus BASILARCHIA Scud.

WEIDEMEYR'S ADMIRAL *(Basilarchia weidemeyrii* Edw.) is a western insect having its stronghold in the Colorado Rockies, but represented by slightly modified races in Arizona, Nevada and California. The particular variety occurring in this state is the race *nevadæ*.

It will be found sparingly in mid-summer, throughout the Mono Basin.

This handsome Admiral must be sought in moist situations where willow abounds, or on mountainous slopes that are clothed in quaking aspen. Hence there are only a few sites within its California range where it may be found. For some unknown reason it has not obtained a footing in the high Sierras, although environmental conditions would seem to favor its presence there.

Early Stages. Described by W. H. Edwards in the "Canadian Entomologist," Vol. 24, p. 107. The larva and pupa are very similar to those of certain eastern species of the genus.

Larval food-plants. Cottonwood, poplar, aspen and willow.

Illustrated. Plate 45. ♂ fig. 1; ♀ under side fig. 2.

LORQUIN'S ADMIRAL *(Basilarchia lorquini* Bdv.) dominates the genus on the west coast. It frequents water courses and moist wooded areas, being especially abundant in river bottomlands that are overgrown with willow. The flight of this boldly marked butterfly is characterized by a series of short twitching motions, with the wings held nearly flat, interspersed with leisurely volplaning. Frequently stops are made on exposed perches, where it delights in basking.

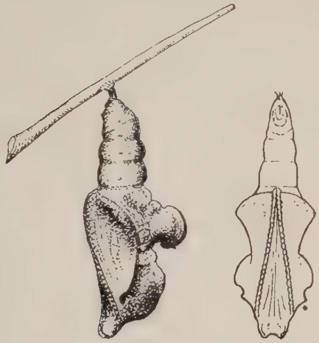


FIGURE A43
Chrysalis of *Basilarchia lorquini*, Slightly Enlarged

There are at least two broods in a season.

Early Stages. Fully described by Dr. Dyar in the "Canadian Entomologist," Vol. 23, p. 172.

Egg. Nearly spherical, with elevated reticulations, which bear short spines arising from the points of intersection. It is pale green, with a silvery lustre, and is laid singly at the extreme tip of the leaf.

Caterpillar. When mature, an olive-brown, with variously colored patches and mottlings. The head is bilobed, with two projecting points. On the third segment there is a pair of roughened horns. Posterior to this are a number of paired tubercles, the largest being on segment thirteen. There are three dorsal enlargements, located on segments three, four and six. The latter segment has an olive-yellow mottling. A whitish patch occurs on the dorsum, located between segments eight and ten. A lateral band of white runs from segments five to thirteen.

Chrysalis. Shown in Figure A43. The wing-cases are a translucent dark olive-green and the thorax a dull purplish, mottled with white. A mottled sordid white covers the abdominal portions, becoming darker dorsally. The anal regions are black.

Larval food-plants. Willow, poplar, choke-cherry and possibly oak.

Illustrated. Plate 45. ♀ fig. 3; ♂ under side fig. 4.

EAVES' ADMIRAL *(Basilarchia lorquini* ab. *eavesii* Hy. Edw.) is a rare aberration of the previously treated species, which differs from the typical insect in having a row of reddish-brown spots outside of the white central band on the upper surface of wings. It is a great rarity.

Illustrated. Plate 46. ♂ fig. 7.

COMSTOCK'S ABERRANT ADMIRAL *(Basilarchia lorquini* ab. *comstocki* Gunder) is a unique aberrant of *lorquini* which was named for the author by Jean Gunder. The specimen was secured by one of the younger collectors, Robert Russell Crosher, in the Bishop district. The colored illustrations of both surfaces shown in the plates will serve to differentiate this insect, without the need of further description. The type is figured.

Illustrated. Plate 45. ♂ fig. 7. Plate 46. ♂ under side fig. 6.

BURRISON'S ADMIRAL *(Basilarchia lorquini burrisonii* Mayn.) is a northern race of Lorquin's Admiral, which finds its extreme development on Vancouver Island. In this insect the orange-brown apical patch is reduced or suppressed, the white band restricted, and the under surface considerably darker.

Occasionally examples of this type are found in high altitudes of northern California, and for this reason it is included.

Illustrated. Plate 45. ♂ fig. 5; ♂ under side fig. 6.

THE ARIZONA VICEROY *(Basilarchia obsoleta* Edw.) occurs in the southeastern desert portions of the state, and is a rarity. It differs markedly from other members of the genus, both in color and habits of flight. In the latter respects it simulates *Danaus berenice,* a butterfly belonging to a group that are protected by reason of certain acrid qualities of their body fluids. A specimen of the last named insect is shown on Plate 46 in order to demonstrate this mimicry, and the subject is further treated in the chapter on "Protective Coloration and Mimicry."

*Obsoleta* flies in the river bottoms, where it keeps to the higher levels of the cottonwoods, and is therefore difficult to capture.

Early Stages. Undescribed.

Larval food-plants. Cottonwood and willow.

Illustrated. Plate 46. ♂ fig. 1; ♂ under side fig. 2.

## THE SISTERS. Genus HETEROCHROA Bdv.

THE CALIFORNIA SISTER *(Heterochroa bredowii californica* Butler) somewhat resembles Lorquin's Admiral on the superior surface, but may be easily distinguished by the blue lines on the under side of wings. It has been suggested by certain authors that the resemblance above noted is a case of mimicry, but no proof has been put forward that *H. californica* is a protected insect, such as is the case with the *Danaids.* It is well known that members of the Genus *Basilarchia* frequently take mimetic patterns, as in the case of *B. archippus, floridensis* and *obsoleta.* On the other hand, the early stages of *Heterochroa californica* would suggest a close phylogenetic relationship with the *Basilarchias,* which may account for the similarity.

The California Sister is a regal butterfly, of dignified demeanor and exclusive habits. It spends much of its time in solitary flight about the upper branches of the live-oaks, or perched on high vantage points where it can survey the woodland life below. On rare occasions it may descend to moistened spots for a sip of water, but is not addicted to the nectar of flowers. Throughout California and into Arizona, on mountains and foothills, wherever the live-oak grows, there also will be found this handsome butterfly. Its season varies somewhat with the altitude, and extends over a number of months. Freshly emerged examples may be secured in July, but captures have been recorded from May to October.

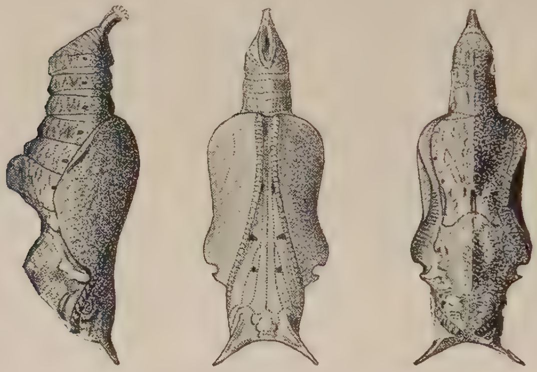


FIGURE A44

Chrysalis of *Heterochroa bredowii californica* Enlarged

Early Stages. These were, in part, recorded by Henry Edwards in the "Proceedings of the California Academy of Sciences," Vol. 5, p. 171. The egg is undescribed.

Caterpillar. When mature, a dark green above, and lighter below, shading into soft brown. The horns and tubercles are somewhat as in *Basilarchia,* but the color is designed to give perfect protection, as it simulates the shades and textures of the *Quercus* leaves and twigs. This makes it an exceedingly difficult larva to observe.

Chrysalis. Pictured in Figure A44, the predominant color being a soft brown, with striae of a darker shade. A number of metallic spots occur on the dorsum.

Larval food-plants. Species of oaks of the Genus *Quercus,* especially, *Q. chrysolepis.*

Illustrated. Plate 46. ♂ fig. 4; ♀ under side fig. 5.

## Family Libytheidae

THE Libytheids are in many respects a remarkable family. They are represented in all the five major subdivisions of the globe, but are restricted to a single genus, and only one species occurs, as a rule, in any given locality.

They are characterized by a remarkable development of the palpi, which gives them the designation of "Snout Butterflies." Some of the species are given to occasional periods of swarming and migration.

### THE SNOUT BUTTERFLIES. Genus LIBYTHEA Fabr.

THE SNOUT BUTTERFLY *(Libythea bachmanii* Kirt.) has occasionally been taken on the California side of the Colorado River. There is no reason why it should not also occur in the Laguna Mountains of San Diego County, as a species of *Celtis* is native there, but as yet no records are available for that district.

*Bachmanii* is one of the species which periodically migrates in immense swarms. Several of these migrations have been recorded for the state of Texas, the last being in September, 1925.

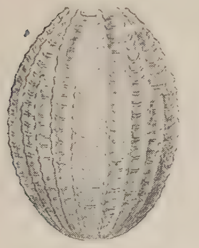


FIGURE A45
EGG OF *Libythea bachmanii,* GREATLY MAGNIFIED

EARLY STAGES. Described by Edwards in the "Canadian Entomologist," Vol. 13, p. 226, and subsequently by other writers.

Egg. Pale green. Pictured in Figure A45.

Caterpillar. Variously colored, but generally of a dark green, with small tubercles scattered over the surface. A yellow mid-dorsal line, and occasionally a light lateral line are present.

Chrysalis. Variable; the usual color being green, with yellow lines on the abdomen, and a number of similarly colored spots or points, variously placed.

Larval food-plant. Hackberry *(Celtis).*

ILLUSTRATED. Plate 47. ♂ fig. 1; ♂ under side fig. 2.

THE SOUTHERN SNOUT BUTTERFLY *(Libythea bachmanii larvata* Stkr.) is a rare form of the previously treated insect, which differs in having larger and more confluent white spots across the subapical area of the primaries, and an extension of the light buff spots in the center of secondaries.

ILLUSTRATED. Plate 47. ♂ fig. 3.

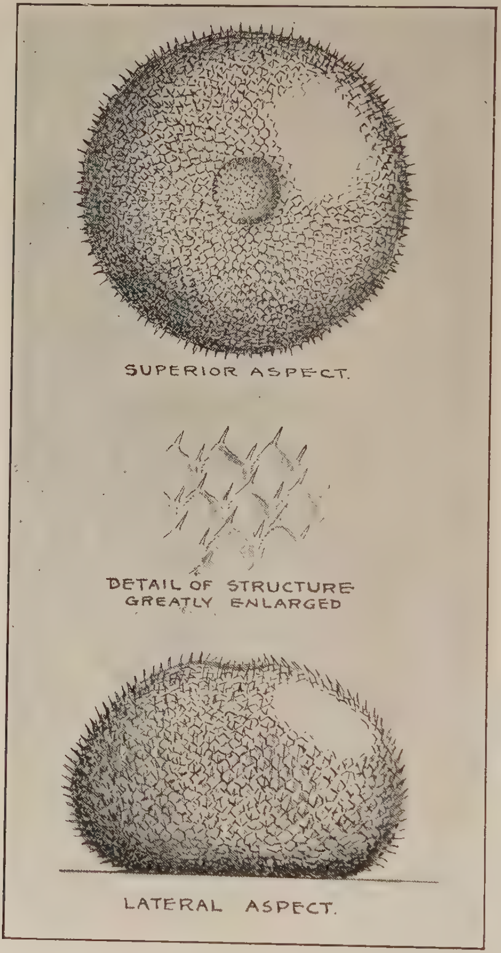

SUPERIOR ASPECT.
DETAIL OF STRUCTURE GREATLY ENLARGED
LATERAL ASPECT.

FIGURE A46

EGG OF *Apodemia mormo virgulti;*
GREATLY MAGNIFIED

## Family Riodinidae

THE Riodinidae, or Metal-marks, are a group which is characteristically tropical, only a few genera reaching the temperate regions of North America. The family numbers some of the most brilliant flies to be found in the world, but the examples which inhabit California do not partake of these spectacular qualities.

They are, for the most part, small insects, of rather weak powers of flight. When resting, they spread the wings so as to show the upper surfaces.

### THE METAL MARKS. Genus APODEMIA F. & F.

THE MORMON METAL-MARK *(Apodemia mormo* F. & F.) is taken sparingly in the desert regions to the south and east of Los Angeles County, on the Mojave Plateau, in the Owen's Valley and the Mono Basin. Occasionally captures are made in other portions of the state.

It is a form that has probably developed in response to an arid environment.

*Mormo* is double brooded in southern California, where freshly emerged examples have been observed in the spring and fall months.

The characteristic feature of the Mormon Metal-mark is the uniform ashen-gray ground color of the upper side of secondaries, and the large amount of white on the under side of the same wings.

As it represents only a race of *virgulti,* which latter species has been carefully studied, the notes on early stages of the last named form will serve for the group.

ILLUSTRATED. Plate 47. ♀ fig. 4; ♀ under side fig. 5.

BEHR'S METAL-MARK *(Apodemia mormo virgulti* Behr) is the commonest member of this group. It occurs abundantly in southern California, and ranges as far north as the Sacramento Valley. The chaparral belt is its favorite habitat, but it is found from sea level to the higher mountains.

*Virgulti* is distinguished from other members of the genus by its darker color and the presence of reddish-brown areas on the upper surfaces of both primaries and secondaries. It is double brooded, the first generation flying in March and April, and the second in August and September.

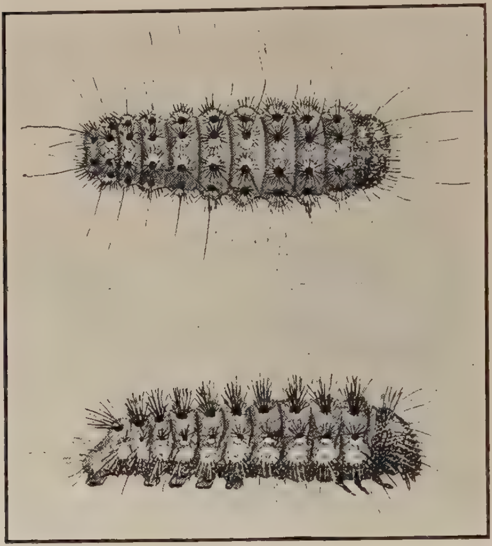


FIGURE A47
LARVA OF *Apodemia mormo virgulti*, THIRD INSTAR, ENLARGED

EARLY STAGES. Described in detail by Karl Coolidge in the "Transactions, American Entomological Society," Vol. 5, p. 324.

Egg. Delicate pink, with the micropyle a shade darker. A deep violet hue is assumed prior to hatching. See Figure A46.

Caterpillar. Shown in Figure A47. The body color is dark violet above, and lighter below. The subdorsal patches are black, edged anteriorly with ochraceous crescents. The series of substigmatal patches are ochraceous, with fuscous tips at the point where the hairs originate.

The second generation of larvæ hibernate before the completion of all their moults.

Chrysalis. Short and plump; the ventral surface flattened, but with a slight sinuous curve. The head is bent down entirely on the ventral surface. The prothorax extends anteriorly, and is broadly rounded. The subconical abdomen tapers evenly to the posterior end. There are minute corrugations over the body surface. Dorsally the pupa bears numerous wavy hairs, which are especially abundant on the anterior extremity of the prothorax. The ventral surface is free of hair. The prevailing color is a mottled brown, with two orange spots on the prothorax.

Larval food-plant. False buckwheat. *(Eriogonum)*.

ILLUSTRATED. Plate 47. ♂ fig. 6; ♀ under side fig. 7.

THE MEXICAN METAL-MARK *(Apodemia mormo mejicanus* Behr) is a large yellow race of *mormo* having its home in southern Arizona and Mexico. While it has not, thus far, been recorded for California, it may occasionally stray over the southern border.

Illustrated. Plate 47. ♀ fig. 13. ♂ under side fig. 14.

THE DESERT METAL-MARK *(Apodemia mormo deserti* B. & McD.) is a race that closely resembles typical *mormo,* but may be distinguished from it by the lighter ground color, and larger white spots. The yellow area of the forewing is also more extensive.

*Deserti* is a rare insect, occurring in a restricted range through the southern arid regions.

Illustrated. Plate 47. ♂ fig. 8; ♀ fig. 12.

THE MARGINED METAL-MARK *(Apodemia palmerii marginalis* Skin.) is a California race of *palmerii.* The latter insect occurs in Arizona. *Marginalis* is limited in range to the Imperial Valley and adjacent desert areas of California. It is double brooded.

Early Stages. Not recorded for the California race, but the metamorphosis of the typical insect is partially given in Edwards' "Butterflies of North America," Vol. 2.

Larval food-plant. Said to be *Beloperone californica.*

Illustrated. Plate 47. ♂ fig. 9; ♂ under side fig. 10; ♀ fig. 11.

## Genus CALEPHELIS G. & R.

## (LEPHELISCA B & L.)

THE DUSKY METAL-MARK *(Calephelis nemesis* Edw.) occurs in the desert portions of California adjacent to the Colorado River. Occasional captures have been recorded in semi-desert regions beyond this area. The insect is more common in Arizona than it is in this state. *Nemesis* and *australis* are merely forms of a single species, the chief difference being in the dark bands which cross the middle of the wings in the former. In a long series, a complete gradation between the forms will be noted.

Two broods are produced in the lower deserts, the spring generation flying in March and April, and the fall brood in September and October.

The colored plate does not bring out sufficiently the characteristic submarginal row of metallic spots.

Early Stages. Unknown.

Illustrated. Plate 47. ♂ fig. 18. ♀ fig. 19.

THE SOUTHERN METAL-MARK *(Calephelis nemesis australis* Edw.) is found in the same territory as the former insect, and represents merely a lighter and more uniformly marked form. Large examples of the females are occasionally mistaken for the eastern *Calephelis borealis.* The difference in shape of the two sexes in this butterfly should be noted. The pointed forewing of the male serves at once to distinguish it.

Illustrated. Plate 47. ♂ fig. 16; ♀ fig. 17; ♂ under side fig. 15.

Palm Canyon in the Coachella Valley
Where *Calephelis australis* Occurs

## Family Lycaenidae

THE LYCÆNIDÆ are divided into three subfamilies—the THECLINÆ or Hair-streaks, the CHRYSOPHANINÆ or Coppers, and the LYCÆNINÆ or Blues.

The Theclinæ are small to medium sized insects. They reach a marvelous development in the Amazon Valley, where the forms are numerous and varied, and the colors often amazingly rich. Those examples extending into the north temperate zone are predominantly obscure. One California species, however, has flashing blue irridescent wings, which hint of the glory possessed by its tropical cousins.

Many of the species have the habit of rubbing their wings back and forth against each other, when at rest.

The Chrysophaninæ are insects of temperate regions, which reach their maximum development in the Old World. The majority of the Eurasiatic species are of a rich metallic red hue, which rightfully earns for them the name of "Coppers." The North American forms are mostly subdued in color, but California possesses two that are particularly brilliant.

The members of this subfamily frequently rest with their wings partially open, so that both surfaces may be observed.

The Lycæninæ or Blues are small insects, the majority of which are a lustrous azure, like bits of summer sky that have dropped to earth. They are widely distributed throughout the world. The Pacific states, and particularly California, are richly endowed with these fascinating forms. No other state possesses an equal number of species.

Many of the Lycænid caterpillars are provided with secretory tubes which exude a liquid that is highly prized by ants. In consequence, they are carefully tended and guarded by these intelligent insects.

## THE HAIR STREAKS. SUBFAMILY THECLINÆ

### Genus HABRODAIS Scud.

BOISDUVAL'S HAIR-STREAK *(Habrodais grunus* Bdv.) is taken throughout the oak belt in the foothills and mountains of California. It fairly swarms, at certain seasons, in the San Bernardino and adjacent ranges, but is somewhat less common in the north.

This somber butterfly delights in perching on a high vantage point in its beloved oak, from which it may dart out on every passing neighbor, in a game of tag. It is single brooded, and reaches the height of its season in July and early August.

Its color is highly protective when at rest, as it then resembles a dry leaf of the live oak.

Early Stages. Undiscovered, although the caterpillar is known to feed upon oaks of the genus *Quercus*.

Illustrated. Plate 47. ♂ fig. 22; ♂ under side fig. 20.

### Genus ATLIDES Hbn.

THE GREAT PURPLE HAIR-STREAK *(Atlides halesus* Cram.) belongs to a group of showy insects that reaches a remarkable development in the tropics. It is a handsome butterfly, with irridescent flashes of color that suggest the opal. Although it has been recorded from scattered and widely separated regions throughout California, it is never common.

*Halesus* has two or more broods on the west coast.

Early Stages. Egg, unknown.

Caterpillar. The mature larva is green, with a velvety appearance, due to the covering of short orange colored pile. This is present over the entire surface except in the central portion of the cervical shield. The hair on the ventral surface is of a lighter shade, being colorless along the central portion of the abdomen. The cervical shield is marked by brownish-black mottlings. See Figure A48.

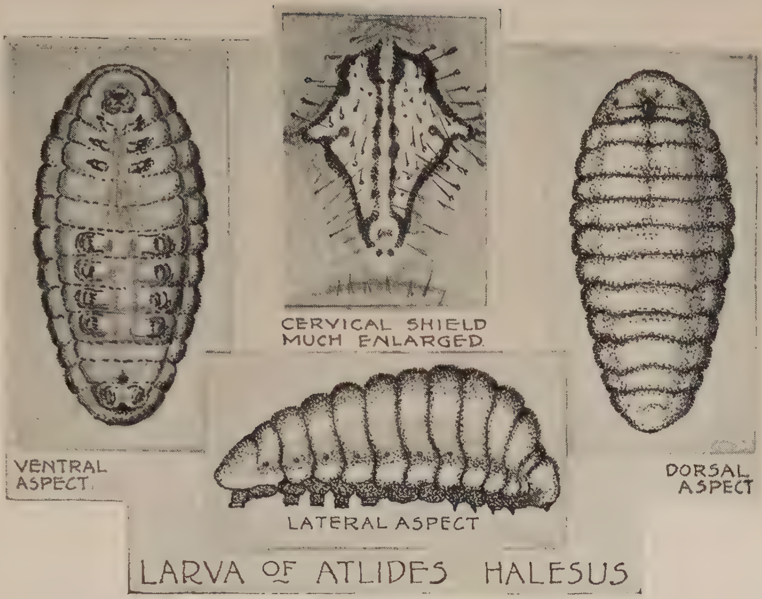

CERVICAL SHIELD MUCH ENLARGED
VENTRAL ASPECT
DORSAL ASPECT
LATERAL ASPECT
LARVA OF ATLIDES HALESUS

FIGURE A48. Caterpillar of *Atlides halesus*, Enlarged

Chrysalis. Mottled with black on a brown background, the markings being heavier at the anterior end. The surface is sparsely covered with short orange-yellow hair, thickest anteriorly and on the lateral abnominal region. This is absent on the wing cases. Figure A49 illustrates this phase.

Larval food-plant. Mistletoe of various species, and possibly also oak.

Illustrated. Plate 48. ♀ fig. 1; ♂ fig. 2; ♀ under side fig. 3.

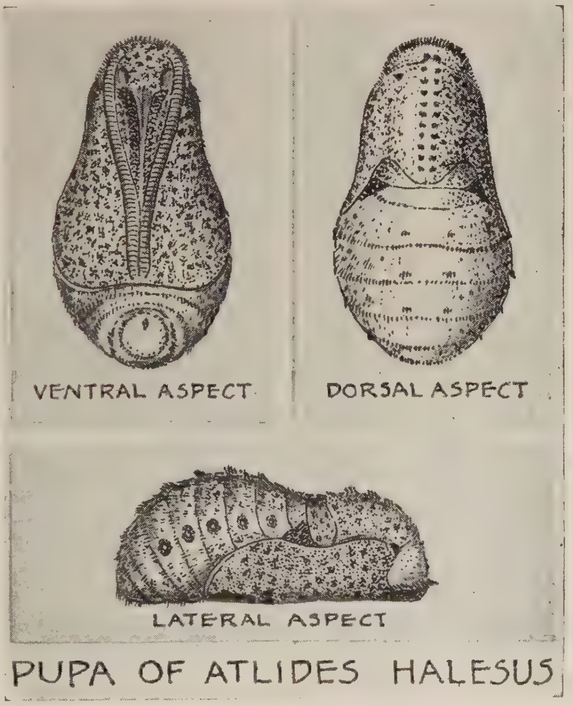

VENTRAL ASPECT
DORSAL ASPECT
LATERAL ASPECT
PUPA OF ATLIDES HALESUS

FIGURE A49
Chrysalis of *Atlides halesus*, Enlarged

### Genus HYPAUROTIS Scud.

THE COLORADO HAIR-STREAK *(Hypaurotis chrysalus* Edw.) is not uncommon in the neighboring state of Arizona, but is a great rarity in California. Only three records of its capture are available to date, all of which are for points in the southern end of the state.

In districts where it abounds it is always found in association with scrub oak.

Early Stages. Unknown.

Illustrated. Plate 48. ♂ fig. 4; ♂ under side fig. 5; ♀ fig. 6.

### Genus STRYMON Hbn.

THE COLUMELLA HAIR-STREAK *(Strymon columella* Fabr.) is an extremely rare butterfly. The few examples that have thus far been netted in California were taken in the southern counties, during the late summer and early fall months. Whether or not there is a spring brood remains to be determined.

This modestly garbed little hair-streak can be distinguished from its near relatives by the fine white points and dashes covering the outer half of the under side of secondaries, and the single pair of short tails.

Early Stages. Unknown.

Illustrated. Plate 48. ♂ fig. 7; ♀ fig. 8; ♀ under side fig. 9.

THE LEDA HAIR-STREAK *(Strymon leda* Edw.) is the smallest member of the genus occurring in California. Its range in this state is limited to the mountains of San Diego, San Bernardino and Imperial Counties, where it is a rarity. In southern Arizona it is apparently abundant. W. S. Wright records two broods; the spring generation appearing in the latter part of June, and the fall brood in October.

Early Stages. Unknown.

Illustrated. Plate 48. ♂ fig. 10; ♀ fig. 11; ♀ under side fig. 12.

THE INES HAIR-STREAK *(Strymon leda ines* Edw.) is a form of leda in which the fine red line crossing the under side of secondaries is reduced in width, and the area internal to this line is of a darker shade of gray than the remainder of the wing.

Illustrated. Plate 48. ♀ under side fig. 13.

THE AVALON HAIR-STREAK *(Strymon avalona* Wright) is an inconspicuous little butterfly found only on Catalina Island, off the coast of southern California. It is therefore one of the world's most restricted species.

On the upper side it somewhat resembles *melinus*, but the inferior aspect, and the smaller size will serve to differentiate it. *Avalona* lacks the heavy crenated black line crossing the under side of secondaries, which is such a prominent feature in *melinus*.

According to Coolidge, the first brood of *avalona* appears in January or early February, and there are successive broods from then on until late fall. The butterflies feed on the blossoms of *Eriogonum giganteum*, but the larval food-plant is probably *Syrmatium ornithopium*.

One must seek this little rarity on the rugged slopes of the Catalina hills, where collecting is not an easy matter, and every capture is an achievement.

Early Stages. Egg. Described by Karl Coolidge in the "Bulletin, Brooklyn Entomological Society," Vol. 18, Dec., 1923. Of the other stages, nothing is known.

Illustrated. Plate 48. ♂ fig. 14; ♀ fig. 15; ♂ under side fig. 16.

THE COMMON HAIR-STREAK *(Strymon melinus* Hbn.) is distributed over temperate North America, and is everywhere a common insect. It may be recognized by the dark slaty-gray of the superior surface, and the bold zig-zag black line, outwardly edged with white, on the under side of secondaries.

*Melinus* has a succession of broods, and the butterflies are on the wing throughout the greater portion of the year.

Early Stages. Illustrated in Figure A50, rendering a description unnecessary. The egg and caterpillar are green, the latter being covered by short dull yellowish to brownish hair. There is considerable variation in the color and maculation of the larva.

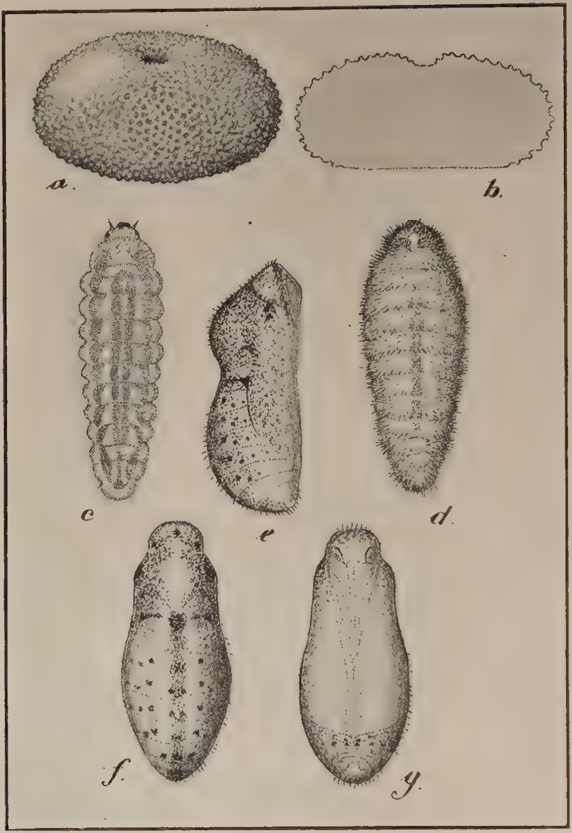


FIGURE A50
Early Stages of *Strymon melinus*
a. Egg, Highly Magnified
b. Egg, in Cross Section
c. Young Larva, Much Enlarged
d. Mature Larva, Enlarged
e. Chrysalis, Side View, Enlarged
f. Chrysalis, Dorsal View, Enlarged
g. Chrysalis, Ventral View, Enlarged

The chrysalis is a delicate brown, heavily maculated with deep brown spots.

Larval food-plants. Include a large number of species of the following genera: *Malva, Sphaeralcea, Polygonum, Hyptis, Crataegus, Hypericum, Cypnoglossum* and *Humulus.* The plant of choice seems to be the common Mallow.

Illustrated. Plate 48. ♂ fig. 17; ♀ under side fig. 18.

THE IMMACULATE HAIR-STREAK *(Strymon titus immaculosus* W. P. Comst.) is a western race of *titus* which ranges toward the coast from its stronghold in Colorado, reaching the extreme northeastern corner of California. This butterfly differs so markedly from all others of the genus as to require no special description. The submarginal band of coral-red spots on the under side of secondaries will serve at once to differentiate it. *Immaculosus* flies in July and August.

EARLY STAGES. These have been given in detail for the typical form of the insect, and there is probably little variation for the western race.

Egg. Broadly domed, and deep green in color. Thickly covered with raised prominences.

Caterpillar. Elliptical, bilobed and shining, with a streak of dull white across the front above the mandibles. The body is dull green above, with a yellowish tint, especially on the anterior joints. It is thickly covered with short brown hair. A dark green dorsal line runs from joints 2 to 4, and there is a patch of dull pink on the anterior joints. A larger patch of the same character, but more roseate, runs from segment 9 to the end of the body. The posterior region of the larva is flattened, and the sides acutely sloped.

Chrysalis. Glossy pale brown, with many small dark brown dots.

Larval food-plants. Wild cherry, wild plum, oak and *Eupatorium coelestinium.*

ILLUSTRATED. Plate 48. ♀ fig. 19; ♂ fig. 20; ♂ under side fig. 21.

THE CALIFORNIA HAIR-STREAK *(Strymon californica* Edw.) is widely distributed throughout the Pacific seaboard. It is essentially a foothill and mountain form, and is found abundantly in its favorite haunts during the summer months. *Californica* may be distinguished from its nearest ally, *sylvinus,* by the darker ground color of the under side, and the presence of three or four submarginal red spots on the secondaries.

This energetic little butterfly could easily elude the collector, were it not for the passionate fondness which it has for a variety of blossoms, and the utter preoccupation of its feeding.

Early Stages. Unknown, in spite of the abundance of the species. The larva probably feeds on oak.

Illustrated. Plate 48. ♂ fig. 22; ♀ fig. 23; ♀ (variant) fig. 24; ♂ under side fig. 25.

THE SYLVAN HAIR-STREAK *(Strymon sylvinus* Bdv.) is widely distributed throughout California. It is a common species in the south, and occurs with increasing scarcity toward the northern limit of its range.

The light gray ground color of the under side, and single spot near the anal angle of secondaries, will help to differentiate this species from its near allies.

*Sylvinus* is always found in association with willows and its favorite haunts are therefore in stream beds and watered canyons. It flies in June and July.

Early Stages. Recorded in part by Dr. Dyar, as *californica* in the "Entomological News," Vol. 5, p. 329.

Larval food-plant. Willow.

Illustrated. Plate 49. ♂ fig. 1; ♀ fig. 2; ♀ under side fig. 3.

THE DESERT HAIR-STREAK *(Strymon sylvinus desertorum* Grin.) is a race of the previous species, of somewhat doubtful status. It differs from typical *sylvinus* in being somewhat lighter on the upper surfaces, and having the row of submarginal black spots on the under side much reduced in size. The types were taken at Oak Creek in Kern County, and are shown on the colored plate.

Illustrated. Plate 49. ♂ under side fig. 4; ♀ fig. 5.

THE DRYOPE HAIR-STREAK *(Strymon dryope* Edw.) has given rise to much controversy. Several other species have been confused with it, and there is still some question as to its validity. The chief difference between *dryope* and *sylvinus* lies in the fact that the former lacks the single short tail on the secondaries. This is not, of itself, a sufficient warrant for separating it, since it is frequently found that in a series of freshly emerged *sylvinus* there will be a few tailless examples. It is possible that the shorter more rounded wings of *dryope* (as shown on the colored plate) may be of greater specific value.

True *dryope* is rare in collections, and occurs in a restricted range through central to northern California.

Illustrated. Plate 49. ♂ fig. 6; ♀ under side, fig. 7; ♀ fig. 8.

THE GOLDEN HAIR-STREAK *(Strymon auretorum* Bdv.) is such a decided rarity that it was found impossible to secure an example for illustration. A half-tone figure of Dr. Oberthur's illustration of Boisduval's type is however shown on Figure A51. A southern race *(spadix* Hy. Edw.) is so nearly like it as to serve for purposes of comparison. *Auretorum* is of a richer, more golden brown than *spadix,* and there is a suggestion of one or two yellowish spots near the anal angle of the upper side of secondary. On the under side of this wing there occurs a submarginal row of spots, inwardly shaded with black. These are small, poorly defined and become lost as they approach the costa. In other respects the two forms are similar. This rare species should be sought in the mountains of central to northern California, during the early summer months.

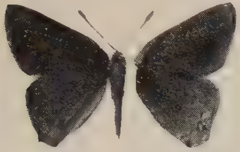


FIGURE A51
*Strymon auretorum*

Early Stages. Unknown.

Illustrated. (Uncolored Figure A51). No colored figure is shown.

THE NUT-BROWN HAIR-STREAK *(Strymon auretorum spadix* Hy. Edw.) is the southern race of *auretorum,* as previously stated.

This rare little hair-streak occurs in isolated and widely separated colonies through the mountains of southern California. The male is a uniform dark brown above and a lighter shade below. The submarginal spots on the under side of secondaries are small and indistinct. The female is a lighter brown, with a yellow-brown area on the upper side of primaries. *Spadix* flies in June and July.

Early Stages. Unknown.

Illustrated. Plate 49. ♂ fig. 9; ♂ under side fig. 10; ♀ fig. 11.

THE GRAY HAIR-STREAK *(Strymon adenostomatis* Hy. Edw.) is a denizen of the chaparral. Wherever the Chamiso occurs, and the summer sun beats fiercely down on the "elfin forest," there will be found this vigorous little butterfly.

The mouse-gray color of its upper surfaces serves to distinguish it.

The species is abundant in southern California, but becomes scarce in the northern limits of its range.

It is single brooded, flying at its best in June and July.

Early Stages. Unknown, notwithstanding the fact that the food-plant is the common *Adenostoma,* and the butterfly is abundant.

Illustrated. Plate 49. ♂ fig. 12; ♀ fig. 13; ♂ under side figs. 14 and 15.

THE HEDGE-ROW HAIR-STREAK *(Strymon saepium* Bdv.) is a variable species, which has developed a number of geographic races and forms. The typical insect is accurately pictured in the color plate. The nut-brown shade of the under side, combined with the sepia of the superior surface should be especially noted. Another distinguishing feature is the fine series of lines on the under side of secondaries, which are outwardly, and narrowly edged with white. *Saepium* is a common butterfly throughout the mountains of the Pacific states. It flies in June and July.

Early Stages. Unknown.

Illustrated. Plate 49. ♂ fig. 16; ♀ fig. 17; ♂ under side fig. 18.

THE TAWNY HAIR-STREAK *(Strymon saepium fulvescens* Hy. Edw.) is merely a form of *saepium* in which the color is much lighter on both upper and under sides. It is a rarity.

Illustrated. Plate 49. ♀ fig. 19; ♂ under side fig. 20.

THE PURPLISH-BROWN HAIR-STREAK *(Strymon saepium chlorophora* Wats. & W. P. Comst.) is a form or race of *saepium* in which the color of the upper side is of a richer and deeper shade, that appears in some lights to have almost a purplish quality. The under surfaces are also darker than in typical *saepium*, and the wings are slightly more elongate.

*Chlorophora* is the common form of this insect in San Diego County, and it occurs also in other districts of southern California.

Illustrated. Plate 49. ♂ fig. 21; ♂ under side fig. 22.

THE BRONZED HAIR-STREAK *(Strymon chalcis* Edw.) is probably only another form of *saepium*. It is held as a separate species, however, in the latest list of Barnes and Benjamin, and is therefore treated as such.

The under surface of this butterfly lacks the usual spots in the marginal area, and the inner two-thirds of the wings are of a slightly deeper shade. The color of this surface is a soft brown, of a different quality than either *saepium* or *chlorophora.*

*Chalcis* is a great rarity.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 49. ♂ under side fig. 23.

## Genus MITOURA Scud.

THE THICKET HAIR-STREAK *(Mitoura spinetorum* Hew.) has a wide distribution in the mountain states of the west, from Arizona to Montana. In California it has been taken at widely separated points, from the northern tier of counties to San Diego. In spite of this extensive range it is one of the rarest Hair-streaks.

This species was mistaken for *Strymon m-album,* by some of the early workers, which accounts for the erroneous inclusion of this Floridian insect in California lists.

On the superior surfaces *spinetorum* is a slate gray, overshot with steel blue. The under side is brown, and both wings are crossed by a bold white line, which is crenated on the posterior half of the secondaries.

The insect is probably single brooded, and captures are recorded for the months of July and August.

EARLY STAGES. Undiscovered.

ILLUSTRATED. Plate 49. ♀ fig. 24: ♂ under side fig. 25.

THE CUYAMACA HAIR-STREAK *(Mitoura spinetorum cuyamaca* W. S. Wright) is a variant of *spinetorum* in which the white line of the secondaries is formed into a W at the point internal to the tails. The same arrangement holds in varying degrees for *spinetorum,* but reaches an extreme in Wright's form, where the base of the W touches the submarginal spots. Barnes and Benjamin consider *cuyamaca* to be a synonym of *spinetorum.*

ILLUSTRATED. Plate 49. ♀ under side fig. 26.

JOHNSON'S HAIR-STREAK *(Mitoura johnsoni* Skin.) is a close relative of *spinetorum.* It has not been recorded for California, but may eventually reach our northern borders. The types were taken at Seattle, and in British Columbia.

This exceedingly rare butterfly has not heretofore been illustrated, hence the publication of the colored figure will be of service to lepidopterists.

Early Stages. Brief mention is made of the larva and pupa in the "Entomological News," Vol. 15. p. 298. The caterpillar feeds on *Arceuthobium douglassii,* and bears a remarkable resemblance to the plant, not only in coloring, which is a yellowish green in the plant that is duplicated in the larva, but with dark hastate markings which imitate the shaded portions between the leaf clusters.

Illustrated. Plate 47. ♂ under side fig. 21.

NELSON'S HAIR-STREAK *(Mitoura nelsoni* Bdv.) occurs in the higher mountains of California. It is not uncommon in the Yosemite region, but seems rare in other portions of the state. The butterfly is rather local, and hence usually escapes the attention of the collector.

*Nelsoni* is figured with sufficient accuracy on Plate 50, to render a description unnecessary.

Henry Edwards named an aberration of this species *(exoleta)* in which "the whole of the lower surface is dull chestnut brown, with the marginal lunules of the secondaries exceedingly indistinct. The narrow white median band of secondaries, and the submarginal band of primaries are entirely wanting."

*Nelsoni* flies in June and July.

Early Stages. Unknown.

Illustrated. Plate 50. ♂ fig. 1; ♀ fig. 2; ♀ under side fig. 3.

JOHN MUIR'S HAIR-STREAK *(Mitoura nelsoni muiri* Hy. Edw.) is a form of Nelson's Hair-streak in which the general color is somewhat darker, and the submarginal white band on the under side of primaries is longer and more distinct. On the secondaries this line is more clearly defined and angular. The area internal to this line is darker. The submarginal spots are large and clearly defined, and are edged about with a purplish shade.

Illustrated. Plate 50. ♀ under side fig. 4.

THE JUNIPER HAIR-STREAK *(Mitoura siva juniperaria* Comst.) frequents the juniper belt of the Southern California mountains and deserts, ranging from Kern County south to San Bernardino. This area runs along the northeastern slope of the southern Sierras, extending down to the Mojave plateau. It is semi-desert in character.

*Juniperaria* is a timid creature, never venturing far from its beloved juniper. To secure it, one must walk through the thickets, tapping each tree. The butterfly will dart out and circle around the nearest tree-top for a few times, then settle down on a green perch, not far from its starting point. Only thus may it be observed and captured.

The color and markings of the insects' under surfaces are perfectly harmonized with its environment. This is equally true in all the stages of its metamorphosis, and seems to be the rule with nearly all of the insects of this interesting region. Other insects, such as spiders, katy-dids, and various hemipterids are camouflaged in like manner. Three different lepidopterous larvæ are found on the junipers, which ideally illustrate this remarkable protective coloration. (See Figure A52.) One is the caterpillar of a Geometrid moth *Phasiana curvata*. This is marked with a series of triangles, in varying shades of green, exactly as are the terminal twigs of the juniper. The other, an undetermined species, is a combination of brown and green, in exact imita-

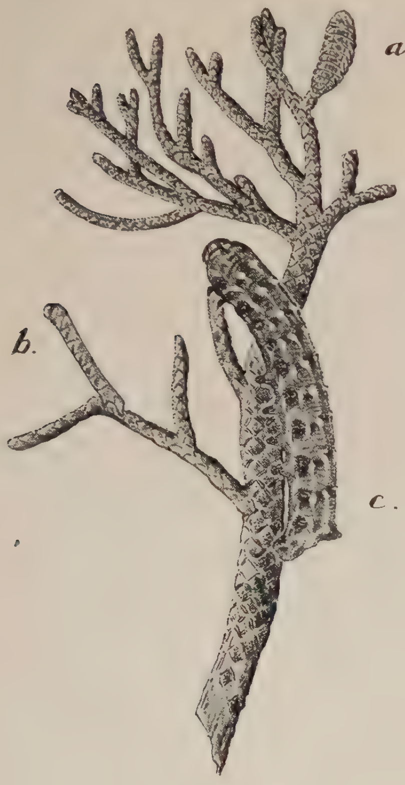


FIGURE A52

"Copycaterpillars"

Sprig of Juniper, With Three Protectively Colored Caterpillars

a. Larva of *Mitoura siva juniperaria.*

b. Larva of *Phasiana curvata,* in Characteristic Pose.

c. Unidentified Larva of Moth.

tion of the smaller branches of the tree. The third is the larva of *juniperaria.* This resembles the small end-twigs of the food-plant so perfectly as to be indistinguishable from its surroundings.

The butterfly is on the wing in April and May.

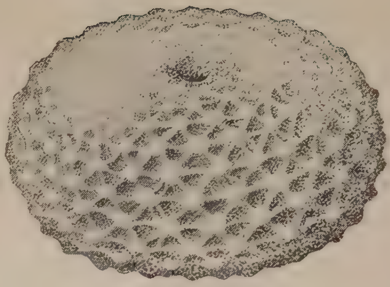


FIGURE A53
Egg of *Mitoura siva juniperaria,* Highly Magnified.

Early Stages. Described by Karl Coolidge (as *M. loki*) in the "Entomological News" of June, 1924, p. 199. The illustrations in Figures A53 and A54 obviate the necessity of a lengthy description. The egg and caterpillar are green, and the chrysalis a wood brown, with darker reticulations and markings.

Illustrated. Plate 50. ♂ (holotype) fig. 5; ♀ (allotype) fig. 6; ♀ (paratype) under side fig. 7.

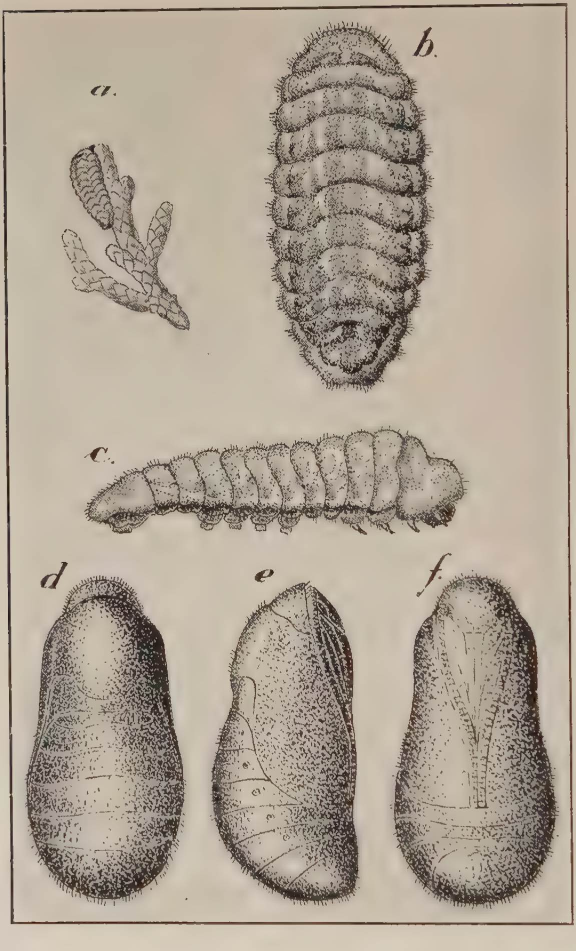


FIGURE A54
Early Stages of
*Mitoura siva juniperaria*
a. Larva on sprig of juniper. b. Larva, third instar, much enlarged. This was drawn just prior to moulting, and is stouter than in the active feeding period. c. Larva, third instar, lateral view; much enlarged. d, e, f, Pupa, much enlarged, showing dorsal, ventral and lateral aspects.

SKINNER'S HAIR-STREAK *(Mitoura loki* Skin.) is a rare insect, occurring in a restricted district of the San Diego Mountains adjacent to Jacumba Hot Springs. As with the former species, it is limited to the juniper belt, and may extend through the Laguna Mountains wherever that tree is found. Its habits are very similar to those of *juniperaria,* but it may be distinguished from the latter by the submarginal row of spots on the under side of secondaries, which are continuous across the entire wing. There is also a brown mottling on the inner half of the same wing, which is absent in *juniperaria.*

*Loki* is an early summer insect, flying at its best in June.

EARLY STAGES. Should be easy of determination, as the larval food-plant is undoubtedly *Juniperus californica.* They are, as yet, undiscovered.

ILLUSTRATED. Plate 50. ♂ fig. 8; ♀ under side fig. 9.

### Genus INCISALIA Scud.

THE WESTERN ELFIN *(Incisalia iroides* Bdv.) is a common insect throughout the lowlands and mountains of the Pacific states. It is an early spring butterfly, appearing on the coastal plains of southern California in March. At higher elevations its time of emergence is retarded.

*Iroides* is an easy butterfly to capture on account of its love for the nectar of flowers, especially the *Ceanothus* blossoms.

EARLY STAGES. Larva and pupa briefly described by Henry Edwards in the "Proceedings, California Academy of Sciences," of June, 1878.

Larval food-plant. *Sedum spathulifolium.*

ILLUSTRATED. Plate 50. ♂ fig. 10; ♀ fig. 11; ♀ under side fig. 12.

THE WESTERN BANDED ELFIN *(Incisalia eryphon* Bdv.) may be at once distinguished from *iroides* by the dark zigzag lines and spots on the under side. It is a mountain butterfly, being widely distributed throughout the ranges of the Pacific states, and occurring always in the coniferous belt. Midsummer finds it on the wing, but never in great numbers.

EARLY STAGES. Unknown, although the larval food-plant is believed to be pine. It should be an easy matter to induce the females to oviposit, and record the metamorphosis.

ILLUSTRATED. Plate 50. ♂ fig. 13; ♀ fig. 14; ♀ under side fig. 15.

## Genus **CALLOPHRYS** Billb.

THE BRAMBLE HAIR-STREAK *(Callophrys dumetorum* Bdv.) is a brilliant green on the under surfaces, the secondaries being crossed by a line of white spots, varying in number. It occurs in the San Francisco region. The name *dumetorum* was originally applied to all of the green species of *Callophrys* occurring in the southwest, but these have since been separated into a number of species, races, and forms. The green coloration of this species is of a more intense hue than in any other member of the group. On the upper side, the male is slaty-gray, and the female gray-brown. It is on the wing in March and April.

Early Stages. Caterpillar and chrysalis described by Williams in the "Entomological News," Vol. XXI, p. 36. All of the phases are probably so similar for the various races as to be fully covered by Coolidge's work on the form *perplexa,* which is noted below.

Larval food-plant. *Eriogonum latifolium.*

Illustrated. Plate 50. ♂ under side figs. 16 and 21 (showing variation in the number of white spots); ♂ fig. 25; ♀ under side fig. 20.

THE PERPLEXING HAIR-STREAK *(Callophrys dumetorum perplexa* B. & Benj.) is a race of the former species which is widely distributed throughout California. It differs from the typical insect in lacking the white spots on the under surfaces, and in the quality of green, which is of a more subdued shade. There is also a larger area of gray on the posterior portion of the under side of primary than occurs in typical *dumetorum.* Occasional examples may show slight traces of the white points on the secondary. This is one of the common insects of early spring in the lowlands. It is an agile butterfly, requiring dexterity to capture. Only one brood occurs in a season.

Early Stages. Given in great detail by Karl Coolidge in the "Transactions, American Entomological Society," Vol. 50, p. 329.

Egg. Laid, usually, on the sepals of the unfolding buds of the food-plant. The shape is that of a flattened sea-urchin, and it is covered with a raised white network, forming cells of irregular form and arrangement. At the points where the reticulations meet, low abrupt buttresses are formed. The ground color is deep green.

Caterpillar. Slug-shaped, and stout. The body is covered with numerous short hairs, of a brownish shade, and is variable in color, the usual tint being a bright green. The cervical shield is rosaceous or whitish. There is frequently a yellow subdorsal and a lateral white line.

Chrysalis. Stout and broad—the abdomen a little broader than high, and well rounded. The surface is roughened by a network of raised dark brown lines, irregularly arranged. Many roundish black papillae are scattered over the body, and these are topped by short brown hairs. The body color varies from a deep brown to blackish.

Pupation occurs in debris under stones and about the base of the food-plant. A weak girdle is occasionally present.

Larval food-plants. *Syrmatium, Hosackia,* and *Eriogonum.*

ILLUSTRATED. Plate 50. ♀ fig. 17; ♀ under side, fig. 18; ♂ fig. 19.

### Genus CALLIPSYCHE Scud.

BEHR'S HAIR-STREAK *(Callipsyche behrii* Edw.) is a distinctive little insect that can not be confused with any other member of the family. It is a butterfly of the uplands, frequenting the plateaus and mountains of northern California in great numbers, and extending south through the Sierras. An isolated colony also exists in the San Bernardino Mountains, on the Mojave slope.

*Behrii* is a docile insect especially when it is feeding on the flowers of the wild buckwheat, in which it delights. It then becomes so preoccupied that it may be picked by hand. June to early August represents its season.

EARLY STAGES. The larva feeds on Lupines, *Lotus,* and *Astragalus,* according to Miss McGlashan, but no record has been made of any stage in its metamorphosis.

ILLUSTRATED. Plate 50. ♂ fig. 22; ♂ under side fig. 24.

GUNDER'S ABERRANT HAIR-STREAK *(Callipsyche behrii* ab. *nigroinita* Gunder) is an aberration of the preceding insect in which the yellow-brown areas of the upper surface have become greatly restricted. The type, which is figured, was taken in the Mammoth district of Mono County.

ILLUSTRATED. Plate 50. ♂ fig. 23.

### Genus SATYRIUM Scud.

THE SOOTY GOSSAMER-WING *(Satyrium fuliginosa* Edw.) is a demure and sombre inhabitant of the northern portions of the state, where it frequents the mountains and higher plateaus. It ranges from thence northward to Washington, and east to the Rockies.

The unicolored upper surface, and the plain gray of the under side with its row of black dots, will serve to distinguish it. The species is not common. It flies in July and early August.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 50. ♂ fig. 26; ♂ under side fig. 27; ♀ fig. 28.

## THE COPPERS. SUBFAMILY CHRYSOPHANINÆ

### Genus THARSALEA Scud.

THE AROTA COPPER *(Tharsalea arota* Bdv.) is found in scattered colonies throughout practically the entire state. Its presence in a given locality is determined by the prevalence of the food-plant. Wherever species of currant or wild gooseberry abound, *arota,* or one of its forms, is likely to be found.

The butterfly is never abundant. It is single brooded, and flies from May to early August, with June as the favored month.

The colored figures of this species, shown on Plate 51, were reproduced from Oberthur's illustrations of the types, in which the left portion of each figure represents the under surface.

EARLY STAGES. Partially described by Dyar in the "Canadian Entomologist," Vol. XXIII, p. 204.

Egg. Undescribed, but probably similar to that of the southern race, *nubila,* which is shown in Figure A55.

Caterpillar. Elongate and elliptical, with the sides sloping and the dorsum forming a narrow flattened ridge.

The body is covered with minute pile, and bears numerous small white granulations. A subdorsal whitish discontinuous line is present, and a similar, though fainter line occurs on the subventral ridge. These lines have the appearance of being slightly below the surface. Color, testaceous.

Chrysalis. Robust, short, and rounded, with a slight depression between the thorax and abdomen. The former bears a few black specks, and a smoky-black dorsal line, which is continued as a row of dots on the abdomen. Lateral to this, in the central portion of the thorax, is a white streak, supplemented on the posterior part by a short white curved line.

On the abdomen there is a subdorsal row of blackish spots, and a number of smaller black dots, posterior to which occurs an obscure white line on each side of the dorsal row of dots. The abdomen is pinkish on the sides.

Larval food-plant. *Ribes.*

Illustrated. Plate 51. ♂ fig. 1; ♀ fig. 4.

THE CLOUDY COPPER *(Tharsalea arota nubila* Comst.) is a southern race of *arota.* The types were taken in Griffith Park, Los Angeles. Possibly all of the southern California examples are of this form, but this point remains to be determined. *Nubila* differs from typical *arota* in its darker coloration and wider marginal band. In the female there is a restriction of the orange areas. It flies in June and July, but never in abundance.

Early Stages. Egg. A sordid white, having an encrusted appearance. Pictured in Figure A55. The female oviposits on the currant stems, at the point of juncture with the young buds. The eggs do not hatch until early in the following spring.

Caterpillar. Undoubtedly resembles the larva of the typical insect.

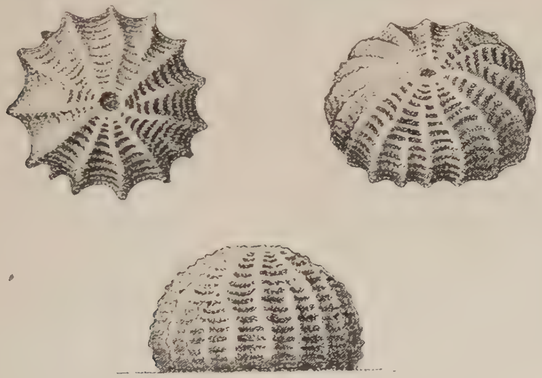


FIGURE A55
Egg of *Tharsalea arota nubila,*
Highly Magnified

Chrysalis. Unknown, but probably the same as for *arota.*

Larval-foodplant. *Ribes gracillimum.*

Illustrated. Plate 51. ♂ (holotype) fig. 2; ♀ (allotype) fig. 3; ♂ (paratype) under side fig. 5.

THE NEVADA COPPER *(Tharsalea virginiensis* Edw.) was named for the historic mining town of Virginia City, where the types were collected. The only difference between it and *arota* is in the white bar on the under side of the secondaries. In the Nevada Copper this is formed by a series of connected lunules.

*Virginiensis* ranges from northeastern California to Colorado. In the Bridgeport district the butterflies showed a predilection for the blossoms of *Arnica cordifolia,* and were easily captured while feeding.

EARLY STAGES. Undiscovered.

ILLUSTRATED. Plate 51. ♂ fig. 6; ♀ fig. 7; ♂ under side fig. 8.

THE HERMES COPPER *(Tharsalea hermes* Edw.) is exceedingly restricted in range, as it is found only in the canyons adjacent to the city of San Diego. It is a fascinating little sprite as it darts about in the sunlight, or sports its showy colors while balanced on a tuft of wild buckwheat.

*Hermes* flies from late May to early July. It will always be a rarity, and may, in fact, some day become extinct, if San Diego continues to expand at its present rate.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 51. ♀ fig. 9; ♂ under side fig. 10; ♂ fig. 11.

### Genus HEODES Dalman

THE GORGON COPPER *(Heodes gorgon* Bdv.) is one of our more common species, occurring throughout the state. It shows a preference for mountainous districts, but is occasionally taken in the lowlands. *Gorgon* is single brooded, and flies in mid-summer. The male and female are quite different in aspect, as will be noted by reference to the plate.

EARLY STAGES. Undetermined.

ILLUSTRATED. Plate 51. ♂ fig. 12; ♀ fig. 13; ♂ under side fig. 14.

THE GREAT COPPER *(Heodes xanthoides* Bdv.) occurs throughout the greater portion of the state. It is partial to the foothills and lowlands. Captures are recorded from May to August, but June finds it on the wing in greatest abundance. The large size, and dull coloration of *xanthoides* serve to distinguish it.

Early Stages. The egg was described by Henry Edwards in "Entomolog. Americana," Vol. 3, p. 162. Nothing is known of the other phases.

Illustrated. Plate 51. ♀ under side fig. 15; ♂ fig. 16; ♀ fig. 17.

THE MOURNING-GARBED COPPER *(Heodes xanthoides luctuosa* Wats. & W. P. Comst.) is a southern mountain race of the former species. It is characterized principally by the lighter ground color of the under surfaces, and the reduction in size of the spots on the secondaries. The two forms intergrade.

*Luctuosa* was named from specimens secured by the author in the Tehachapi Pass. The colored figures show examples that were taken at the same time in the type locality.

Illustrated. Plate 51. ♂ fig. 18; ♀ under side fig. 19; ♀ fig. 20.

EDITH'S COPPER *(Heodes editha* Mead) is a child of the uplands. In California it is abundant in the flower spangled meadows of the Sierras during midsummer.

*Editha* occupies an extensive territory, ranging northward into Oregon, and east to Yellowstone Park.

It may be differentiated from *xanthoides* by its smaller size, more pointed wings, and relatively larger spots on the under side of secondaries.

Early Stages. Unrecorded, although it is known that the larvæ feed on *Potentilla tenuiloba* and *Horkelia fusca.*

Illustrated. Plate 52. ♂ fig. 1; ♀ fig. 2; ♂ under side fig. 3.

REAKIRT'S COPPER *(Heodes mariposa* Reak.) must be sought in the higher altitudes. It occurs sparingly through the Sierras, and ranges northward to British Columbia, and east to Colorado. *Mariposa* may be differentiated by the heavy mottling on the under side of secondaries, superimposed on a groundwork of gray. It is taken in July. The butterfly is partial to blossoms of *Aster canescens,* and is easily captured when indulging in the nectar of this flower.

Early Stages. Unknown, although the larvæ are said to feed on knot-grass.

Illustrated. Plate 52. ♂ fig. 4; ♀ fig. 5; ♀ under side fig. 6.

THE NIVALIS COPPER *(Heodes nivalis* Bdv.) is one of the rarer species, occurring at high altitudes throughout the Sierras, and extending north and east to the Yellowstone Park. It closely resembles *helloides,* but may be distinguished from it by the lighter coloration of the under side of secondaries. There is frequently a greenish bloom on the basal portion of this wing. The male is of a lighter and more ruddy tone on the upper surface than is *helloides.*

*Nivalis* flies in late June and July.

Early Stages. Undetermined.

Illustrated. Plate 52. ♂ fig. 7; ♀ fig. 8; ♂ under side fig. 9.

THE PURPLISH COPPER *(Heodes helloides* Bdv.) occurs in abundance throughout the lowlands of California. It is one of the most widely distributed members of the genus, ranging throughout the Pacific seabord, and east to the Great Lakes. Moist meadow lands, and stream banks furnish its favorite haunts.

The rich purplish sheen of the male is a pleasing characteristic of this little butterfly.

In Southern California there are six or seven broods in a season.

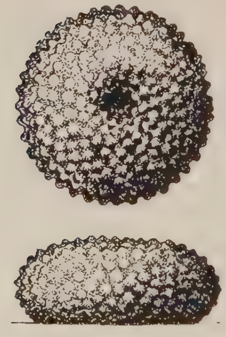


FIGURE A56
Egg of *Heodes helloides.* Enlarged

Early Stages. Described in detail by Karl Coolidge in the "Entomological News," Vol. XXXV, p. 306.

Egg. Illustrated in Figure A56. Color, delicate pale green, with white reticulations and nodules.

Caterpillar. When mature, grass green, covered with numerous spiny bulbous white processes; a bright yellow disconnected line on each side of mid-dorsal region, and another yellowish stripe, laterally placed. There is also a line of yellow oblique dashes on the sides. The body has a covering of colorless hair. Head, pale amber-brown; mouth parts, reddish-fuscous. Eyes, white on a black field.

Chrysalis. Covered with a delicate tracery of raised lines, between which are pale green low warty tubercules, bearing bristles. Ground color, greenish, with various brownish and black streaks and points.

Larval food-plants. Knot-grass *(Polygonum aviculare)*, *Rumex*, *Oxytheca* and *Gayophytum*.

Illustrated. Plate 52. ♂ fig. 10; ♀ fig. 11; ♂ under side fig. 12.

THE LUSTROUS COPPER *(Heodes cupreus* Edw.) flashes its gaudy wings over the meadows of the high Sierras. It delights in the blossoms of the yellow groundsell, and in turn, delights the eye of the beholder with its rich metallic lustre.

*Cupreus* has rather a restricted range through the higher valleys of the Sierra Nevadas, from Tulare County north to Shasta, and thence into eastern Oregon. It flies in July.

Early Stages. Unknown, except for the fact that the larvæ are said to feed on *Rumex*.

Illustrated. Plate 52. ♂ fig. 13; ♀ fig. 14; ♀ under side fig. 15.

GUNDER'S ABERRANT RUDDY COPPER *(Heodes cupreus* ab. *maculinita* Gunder) is a variant of the above species, in which the submarginal row of spots on the upper side are somewhat enlarged and elongated. The type was taken in the Mammoth district of Mono County.

Illustrated. Plate 52. ♀ (type) fig. 16.

THE RUDDY COPPER *(Heodes rubidus* Behr) has much the same metallic lustre as *cupreus*, but may be distinguished from it by the somewhat larger size, and suppression of spots on the under side of the secondaries.

It has a wide range through the mountain states of the west, and is especially abundant on the high plateaus of northeastern California and eastern Oregon, during the summer months. Throughout the Sierra Nevadas it is found in association with *cupreus*.

This flashing little beauty is exceedingly fond of the blossoms of *Arnica cordifolia*.

Early Stages. Undescribed.

Illustrated. Plate 52. ♀ fig. 17; ♂ under side fig. 18; ♂ fig. 19.

THE VARIED BLUE *(Heodes heteronea* Bdv.) was formerly classed with the *Lycaenids* on the basis of its color. All of its structural characters, however, relate it to the Genus *Heodes*.

The male is a flashing, conspicuous fellow in his gaudy blue uniform, and spotless white lining. It is entirely appropriate that he should be bold and dashing in flight. The female is dark, and could easily be mistaken for one of the Coppers.

The species occurs through the Sierras, into the bordering states on the north, and eastward to Colorado. It flies in mid-summer, and is abundant in portions of its territory.

EARLY STAGES. Undetermined.

ILLUSTRATED. Plate 52. ♂ fig. 20; ♂ under side fig. 21; ♀ under side, fig. 22; ♀ fig. 23.

THE BRIGHT BLUE *(Heodes heteronea clara* Hy. Edw.) is a southern race of the previously treated species, which is limited in territory to the Tehachapi and Tejon ranges. It occurs in isolated colonies, preferring small clearings in the forest, and protected mountain meadows.

*Clara* is one of the rarest California butterflies. It is on the wing in July and early August.

ILLUSTRATED. Plate 52. ♂ fig. 24; ♀ fig. 25.

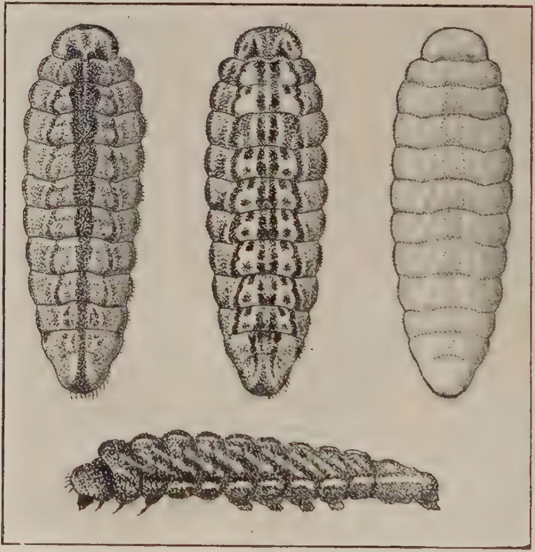


FIGURE A57
LARVAE OF *Leptotes marina*, MUCH ENLARGED

## THE BLUES. SUBFAMILY LYCAENINÆ

### Genus LEPTOTES Scud.

THE MARINE BLUE *(Leptotes marina* Reak.) occupies an extensive territory in the southwest, extending from central California, through Nevada, Arizona and eastward to Texas. While normally a lowland species an occasional stray finds its way into the mountains.

This dainty little Blue fairly swarms in southern California during favorable seasons. There are several broods in a year, but the one maturing in September seems to be the most prolific.

*Marina* is one of the butterflies that is particularly common in the parks and gardens of Los Angeles, due to the fact that several of its food-plants are used as ornamental shrubs and vines.

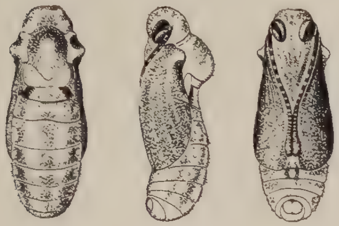


FIGURE A58
PUPA OF *Leptotes marina*, ENLARGED

EARLY STAGES. Pictured in Figures A57 and A58.

Egg. Similar to that of *exilis*, but larger, and of a delicate green color, becoming whiter as it matures.

Caterpillar. Exceedingly variable in color and pattern, no two examples being exactly alike. There seems to be every intergrade between a light green form with almost no markings, and a rich brown with heavy chocolate-colored maculations.

Chrysalis. Nearly naked, but with a few short hairs over the head, dorsum and abdomen. Suspended by a weak girdle. Color, pale brownish-ochraceous; the wing cases pale grayish, semi-transparent, with numerous brown freckles. Otherwise spotted in dark brown, as shown in Figure A58.

Larval food-plants. Wistaria, through the spring months; *Plumbago* after the wistaria blossoms fall. Alfalfa, sweet-pea, *Astragalus*, *Dolichus*, and other vetches have also been recorded. The caterpillars select principally the buds and blossoms.

ILLUSTRATED. Plate 53. ♂ fig. 1; ♀ fig. 2; ♂ under side fig. 3.

GUNDER'S ABERRANT MARINE BLUE *(Leptotes marina* ab. *violacea* Gunder) varies little from the typical insect, except in the partial suppression of the dark suffusion of the upper side, which is characteristic of the normal female of this species.

The type was taken in Riverside County.

Illustrated. Plate 53. ♀ (type) fig. 4.

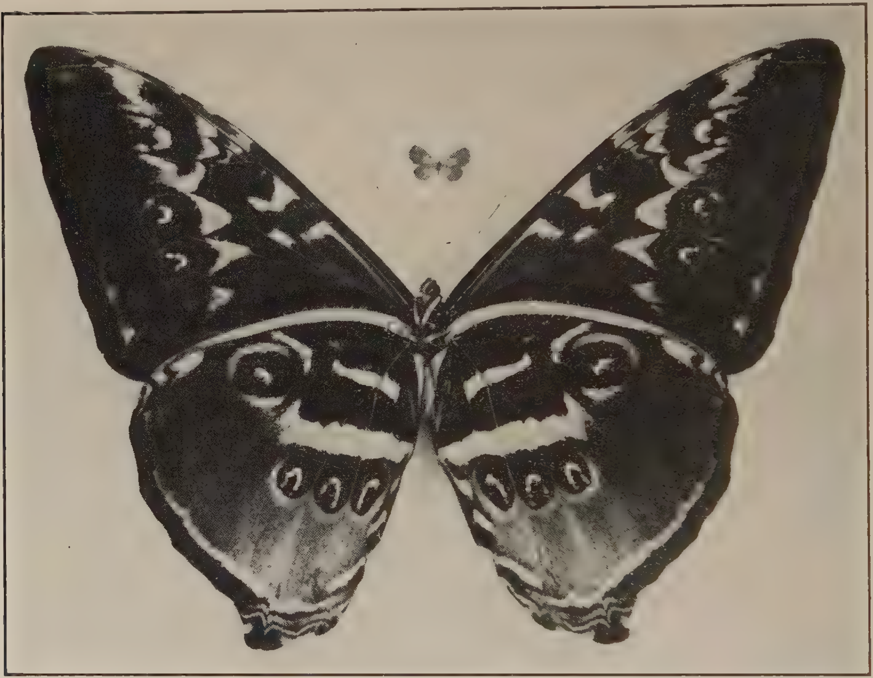


FIGURE A59
Illustrating the disparity in size between two fully matured butterflies. The small figure is *Brephidium exilis* and the large specimen, *Morpho hecuba*

### Genus BREPHIDIUM Scud.

THE PIGMY BLUE *(Brephidium exilis* Bdv.) seldom comes to the notice of the casual observer, on account of its diminutive size and weak flight. It is the smallest North American butterfly, and, in fact, is one of the most minute diurnals in the world. There is wide variation, however, in this respect, as will be noted by reference to figures 5 and 9 of Plate 53, in which two examples of extreme disparity in size are shown.

Size is a matter of small moment with insects, in comparison with structural characteristics. Not only is there great variation in this regard between individuals of the same species, but there is a remarkable range of proportion between different butterflies. This is well illustrated in Figure A59, in which an example of the largest American *Morpho* is shown, in comparison with the Pigmy Blue. This giant of South American butterflies *(Morpho hecuba)* has fully fourteen times the wing expanse of the smaller insect.

*Exilis* is an exceedingly common butterfly in Southern California. Its range extends northward to Yolo or Colusa Counties, where it occurs rather sparingly.

There are many broods in a season, but the period of its greatest abundance is in September. The territory of its choice is in the lowlands, and on the southern deserts, but occasional examples are taken at moderate elevations in the mountains.

Early Stages. Recorded in detail by Karl Coolidge, in the "Entomological News," of April, 1924, Vol. 35, p. 115.

Egg. Illustrated in Figure A61a. Ground color, delicate bluish-green, with a raised white network.

Caterpillar. Densely covered with brownish tubercles bearing minute white processes, as shown in Figure A60b. The latter give it a frosted appearance which exactly simulates the under surface of the *Atriplex* leaf. The body color is a yellowish-green. The surface is finely punctate. A yellowish-white dorsal line and a bright yellow sub-

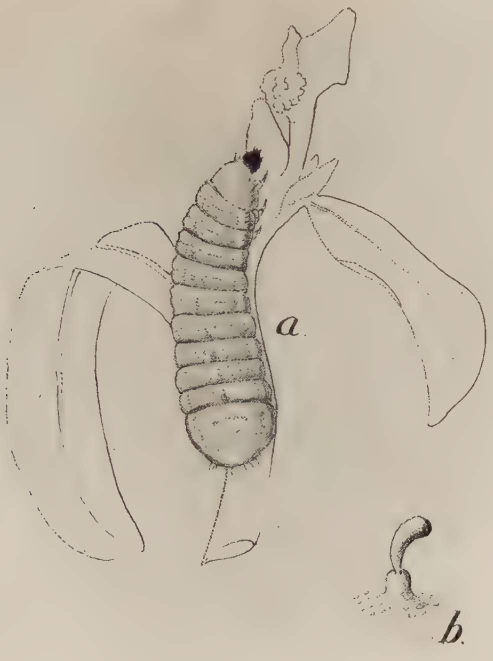


FIGURE A60
a. Young Caterpillar of *Brephidium exilis*, Enlarged
b. Tubercle and Process, Highly Magnified

stigmatal line frequently occur, but the maculations are variable. See Figures A60 and A61.

Chrysalis. Illustrated in Figure A61 c, d and e. Color variable, the usual type being light brownish-yellow, with a fuscous dorsal line. Wing cases, pale yellowish-green, with a few brownish dots. An abdominal sub-dorsal row of dark brown points is frequently present. A few minute colorless hairs are irregularly scattered over various points, particularly on the abdomen. Spiracles white, the centers protruding.

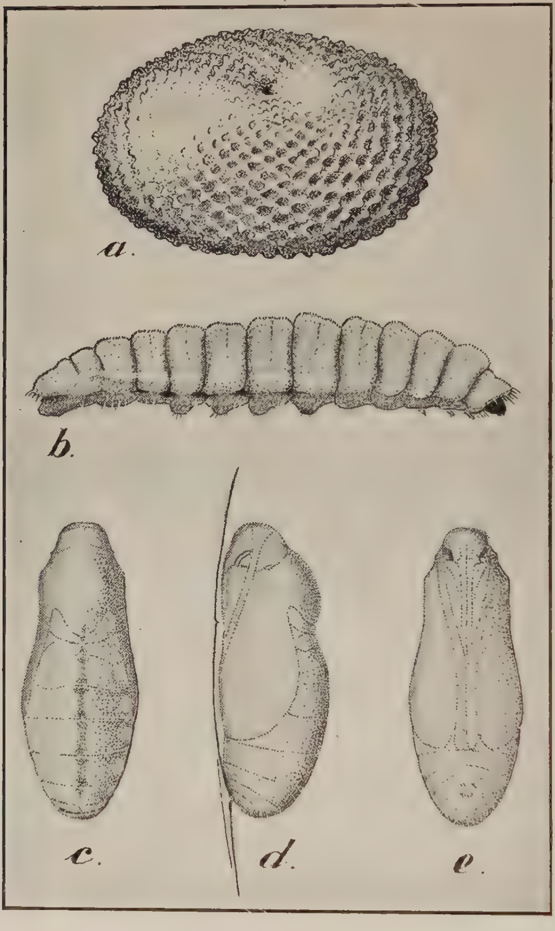


FIGURE A61

Early Stages of *Brephidium exilis*
a. Egg, Greatly Magnified
b. Caterpillar, Enlarged
c, d, e. Chrysalis Enlarged

Larval food-plants. Lamb's tongue *(Atriplex bracteosa)*, *Chenopodium*, and *Petunia parviflora*.

Illustrated. Plate 53. ♀ extra large, fig. 5; ♂ fig. 6; ♀ under side fig. 7; ♂ dwarf, fig. 9.

---

Occasional examples of *exilis* very closely resemble the Gulf Coast species *isophthalma*.

COOLIDGE'S ABERRANT BLUE *(Brephidium exilis* ab. *coolidgei* Gunder) represents a striking variant of the Pigmy Blue. The aberrational tendencies are confined to the under side, which is adequately pictured in the colored plate.

*Coolidgei* is known only from the type.

Illustrated. Plate 53. ♀ (type) under side fig. 8.

### Genus **HEMIARGUS** Hbn.

EDWARDS' BLUE *(Hemiargus gyas* Edw.) is a demure and unpretentious little butterfly, with a restricted range through southern California and Arizona. It may be found in fair numbers throughout the deserts and lowlands, and occasionally in the mountains, from Los Angeles County southward.

There are at least two broods, with captures recorded from June to October.

*Gyas* is sometimes confused with *isola,* which it closely resembles, but it may be distinguished by the absence of the row of black spots on the under side of primaries.

Early Stages. A single example of the egg, recently observed, showed characters very similar to *exilis,* except that it was larger, and the top decidedly depressed. Color, delicate light green.

Larval food-plant. *Astragalus crotalariae.*

Illustrated. Plate 53. ♂ fig. 10; ♀ fig. 11; ♀ under side fig. 12.

REAKIRT'S BLUE *(Hemiargus isola* Reak.) occupies a wide territory extending from Southern California eastward to Illinois, and south to Texas. It is not a common insect in this state but is evidently abundant in portions of Arizona.

On the upper surfaces it closely approximates *H. gyas,* but the presence of a row of black spots, encircled with white, on the under side of primaries will serve, at once, to separate it.

Early Stages. Unknown.

Illustrated. Plate 53. ♂ fig. 13; ♀ fig. 14; ♀ under side fig. 15.

### Genus **EVERES** Hbn.

THE EASTERN TAILED BLUE *(Everes comyntas* Godt.) is a common insect east of the Rocky Mountains, where it is the dominant member of the group. West of this great divide, it occupies a wedge of territory extending through Montana, Idaho and Oregon, into northern California, where it is occasionally taken on the Modoc Plateau, and in the Sierras as far south as Inyo County.

It closely resembles *E. amyntula*, but may be distinguished from it by the restriction in size and number of the black dots on the under surface of wings.

EARLY STAGES. Illustrated in Holland's "Butterfly Book," and recorded by numerous writers. Students may consult the "Canadian Entomologist," Vol. 8, p. 202, for further details.

Larval food-plants. Species of *Leguminosæ.*

ILLUSTRATED. Plate 53. ♀ under side fig. 19.

THE WESTERN TAILED BLUE *(Everes amyntula* Bdv.) ranges over a wide area west of the Rockies, including western British America, California, and the intervening territory. It is not uncommon at moderate elevations in the mountains, and occasional colonies are encountered in the lowlands.

The species is double brooded, captures being recorded from early spring to August.

The possession of hair-like tails is one of the features which distinguishes this, as well as the foregoing butterfly. The two forms are probably merely geographic races of one variable species.

EARLY STAGES. Discussed in some detail by W. G. Wright and W. H. Edwards, in "Papilio," Vol. 4, Sept., 1884.

Egg. Green; of the usual type. Deposited singly on the calyx of the flower pods of the food-plant, occasionally on the stem.

Caterpillar. When mature; color, gray-green. Along either side of the dorsal ridge are numerous whitish bristles, another series of these around the base. Surface covered with short, fine white hairs, arising from black points. Along base, a cream-colored stripe. Under side, blue-green. Head, blackish-brown. Ocelli black.

Chrysalis. Yellow-green, the abdomen whitish. Surface smooth and glossy.

Larval food-plant. *Astragalus crotalariæ.*

ILLUSTRATED. Plate 53. ♂ fig. 16; ♀ fig. 17; ♀ under side fig. 18.

## Genus PLEBEJUS L.

THE ORANGE-MARGINED BLUE *(Plebejus melissa* Edw.) is a widely distributed species, occurring from Kansas westward to the Pacific states.

One of the distinguishing features of this little beauty is the narrow submarginal line of orange on the upper side of both wings in the female. This line is also present as a series of spots on the under side of both wings, in the male and female. *Melissa* flies in July. There may also be an early spring brood.

Early Stages. Briefly commented upon by W. H. Edwards in "Papilio," Vol. 4, pp. 91-93.

Larval food-plants. *Astragalus* and *Lotus*.

Illustrated. Plate 53. ♂ fig. 20; ♀ under side fig. 21; ♀ fig. 22.

THE LOTIS BLUE *(Plebejus melissa lotis* Lint.) is a race of the former species which occurs in isolated colonies throughout the state. It is larger, and more clearly marked, with wider marginal bands in the female. The black spots on the under surfaces are widely separated and larger, and the ground color is a uniform whitish-gray. The types were taken in Mendocino County.

In the Tehachapi Mountains it occasionally flies in great abundance.

Illustrated. Plate 53. ♂ fig. 23; ♂ under side, fig. 24; ♀ fig. 25.

THE ANNA BLUE *(Plebejus anna* Edw.) occurs in a restricted range from approximately Kern County northward through the Pacific states to British America. In California it is a mountain butterfly, its favorite habitat being in the well watered areas of the Sierras, but undoubtedly it descends to lower altitudes in the north.

*Anna* may be distinguished by its larger size, and reduction of the submarginal spots on the under side of both wings; the orange points being frequently entirely absent. It flies from late June to early August, and is not a common species.

Early Stages. Undetermined.

Illustrated. Plate 53. ♂ fig. 26; ♂ under side fig. 27; ♀ fig. 28.

THE GRAY-BLUE *(Plebejus aquilo podarce* F. &. F.) is an alpine species, occurring in high altitudes through the Sierras. Its playground is in the marshy mountain meadows, and along the margins of shallow lakes, where the grass is lush in mid-July.

A retiring and modest little butterfly, is *podarce,* both in demeanor and attire; no glinting display of blue-green satin as with his bolder cousin, Sir *saepiolus.* Instead, only a soft gray-blue for the head of the household, and a demure brown for milady.

Early Stages. Unknown.

Illustrated. Plate 53. ♂ fig. 29; ♂ under side fig. 30; ♀ fig. 31.

THE GREENISH BLUE *(Plebejus saepiolus* Bdv.) covers the far western states, from California to British Columbia, and ranges eastward to Colorado. In California it is confined chiefly to the higher mountains and elevated plateaus. It is especially abundant throughout the Sierras, in June and July. C. L. Fox reports it for Bear Valley, Marin County, which is a lowland territory, but one in which the flora and fauna are more boreal in character. In Colorado, this variable species more normally presents a bluish female, but this coloration is rarely seen in California, where the normal female is of the dark form *rufescens.*

The brightly colored males of *saepiolus* are aggressive and nervous, in strong contrast to the timid and retiring characteristics of the females. The species prefers grassy meadows, and is frequently found in association with *podarce.*

Early Stages. Undescribed.

Illustrated. Plate 54. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

THE RUFESCENT BLUE *(Plebejus saepiolus ♀ rufescens* Bdv.) is the dark female of our California *saepiolus*, and represents the dominant form in sierran examples. It is clearly pictured in the colored plate.

Illustrated. Plate 54. ♀ fig. 4; ♀ under side fig. 5.

THE AEHAJA BLUE *(Plebejus saepiolus* ♀ *aehaja* Behr) so closely approximates *rufescens* as to be considered merely a synonym by several authorities. The males which are found in association with it can not be distinguished from typical *saepiolus.* The name may possibly be retained for a small, high altitude form of the female, having a brownish black uniform coloration on the superior surface.

Illustrated. Plate 54. ♀ fig. 12.

THE HILDA BLUE *(Plebejus saepiolus hilda* Grin.) is a geographic race of *saepiolus* which inhabits the San Jacinto and adjacent ranges in southern California. It occurs at high elevations, and in isolated colonies. *Hilda* may be distinguished from other forms of this polymorphic species by the brighter blue of the males, and the larger spots of the under side, combined with a clear bluish white ground color. The females have an orange submarginal band on the secondaries, which also frequently invades the primaries.

This form is relatively rare, in comparison with typical *saepiolus.*

Illustrated. Plate 54. ♂ fig. 6; ♀ fig. 7; ♂ under side fig. 8.

BOISDUVAL'S BLUE *(Plebejus icarioides* Bdv.) shows a wide range of variation in different portions of its territory, in consequence of which it has been divided into a number of geographic races.

The typical insect occupies an extensive region north of the Tehachapis, extending to British Columbia. It shows a preference for mountainous districts of moderate elevation in the southern portion of its range, but seems to occur at all levels in the northern counties.

Both the male and female of this species are blue, but the latter has a dark marginal suffusion extending inward over a third of the wing. On the under side, both wings contain numerous black dots, encircled with white. The secondaries have a double marginal row, which is rather characteristic, and will serve to separate it from *maricopa.*

Captures are reported from April to September, which suggests at least two broods to account for the long season.

Early Stages. Undescribed, in spite of the fact that the larvæ have been observed feeding on lupine and clover.

Illustrated. Plate 54. ♂ fig. 9; ♀ fig. 10; ♀ under side fig. 11.

An aberration of *icarioides* has recently been described by Jean Gunder, in the "Entomological News," of January, 1926, p. 8. It differs from the typical insect only in the slight enlargement and elongation of the extra-discal row of black spots on the under side of primaries. The name *spinimaculata* was applied to it, and an illustration of the type is shown on Plate 1, fig. 12 of the publication above referred to.

THE DAEDALUS BLUE *(Plebejus icarioides ♀ daedalus* Behr) is a dimorphic female of *icarioides,* in which all of the blue on the upper surfaces is replaced by blackish-brown. The secondaries usually show a few fused submarginal orange spots. It is a great rarity.

Illustrated. Plate 54. ♀ fig. 16.

THE EVIUS BLUE *(Plebejus icarioides evius* Bdv.) is the southern race of *icarioides,* and may be distinguished from it by the narrow, dark margins on the upper side of wings in the male, and the reduction in size of the black spots on the under side of secondaries, in both sexes. These are sometimes entirely absent, only the white points remaining.

This race frequents the mountain ranges below the Tehachapi, where it occurs in abundance. It flies in May and June.

Illustrated. Plate 54. ♂ fig. 13; ♂ under side fig. 14; ♀ fig. 15.

THE MARICOPA BLUE *(Plebejus maricopa* Reak.) has been confused with *icarioides* by numerous authors. The male is darker than the last named insect, and the female is devoid of blue. The secondaries show only a single line of submarginal spots, whereas in *icarioides* these are usually doubled.

*Maricopa* is a central lowland species, with a territory centering in the San Francisco Bay district.

Early Stages. Unknown.

Illustrated. Plate 54. ♂ fig. 17; ♂ under side fig. 18; ♀ fig. 19.

THE PHERES BLUE *(Plebejus pheres* Bdv.) occurs in approximately the same territory as *maricopa.* It is easily separated from allied forms by the soft greyish-white ground color of the under side of secondaries, on which white spots are superimposed, as shown in the plate. The favored period of flight is May to early July.

Early Stages. In spite of the observance of the larva on lupine, by several workers, the metamorphosis has not been recorded. San Francisco entomologists should be able to solve this problem.

Illustrated. Plate 54. ♂ fig. 20; ♀ fig. 21; ♂ under side fig. 22.

THE SHASTA BLUE *(Plebejus shasta* Edw.) strangely belies its appearance, which is that of a delicate insect with weak powers of flight. In reality it is at home in regions of rigorous climate. High on the alpine summits, where bleak exposures serve as the trysting ground for angry cloud and roaring blizzard, is the abode of this brave little species.

In mid-summer, when a few short days of sunshine encourage the stunted flowers of the alpine meadows to show their faces, *shasta* comes out to sport among them. It may be found on the higher peaks, from the California Sierras to Washington, and through Idaho and Montana into Colorado. The mouse gray under surfaces, with a marginal row of metallic bluish-green circlets on the secondaries, will serve to differentiate this distinctive little butterfly.

Early Stages. Undetermined.

Illustrated. Plate 54. ♂ fig. 23; ♀ fig. 24; ♂ under side fig. 25; ♀ under side, fig. 26.

THE YOSEMITE BLUE *(Plebejus shasta comstocki* C. L. Fox.) is a local race of the foregoing species, occurring in the glacial meadows above Yosemite Valley. It is a darker form than typical *shasta.* On the upper surfaces the female is marked by a suppression of blue scales, and a well defined series of submarginal orange lunules on the secondaries. Both sexes, on the under side, show a uniform gray background, without a trace of the white scaling internal to the metallic spots, as in the typical insect.

Illustrated. Plate 54. ♂ (holotype) fig. 27; ♀ (allotype) fig. 28; ♂ under side, fig. 29; ♀ under side, fig. 30.

THE ACMON BLUE *(Plebejus acmon* West. & Hew.) has an extensive range through the western mountain states, from Montana westward to Washington and California. It is taken from sea level to moderate elevations, and flies throughout the greater portion of the season. There are several broods. Those of the early spring show a tendency to a darker and richer coloration.

*Acmon* is an extremely common species, and is subject to wide variation, as a result of which a number of aberrant and seasonal forms, and geographic races, have received separate names.

It is easily separated from other Lycaenids by the orange submarginal band on the upper side of secondaries in both sexes, which is outwardly bordered by a series of black points.

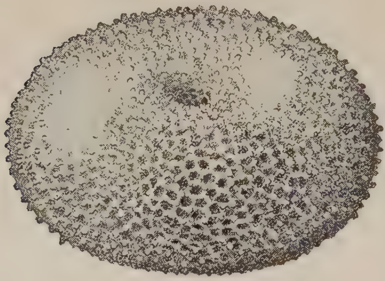


FIGURE A62
EGG OF *Plebejus acmon*
HIGHLY MAGNIFIED

EARLY STAGES. Egg. Illustrated in Figure A62. Color, delicate green.

Caterpillar. Briefly recorded by Henry Edwards (as *L. antaegon)* in the "Proceedings, California Academy of Sciences," April, 1875. Body, dirty yellow, covered with very short downy hairs; a few black spots irregularly scattered, and a narrow greenish dorsal stripe. Head, dark brown.

Chrysalis. Undescribed.

Larval food-plants. *Astragalus, Hosackia, Eriogonum* and *Lotus.*

ILLUSTRATED. Plate 55. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

COTTLE'S BLUE *(Plebejus acmon cottlei* Grin.) represents an early spring form of the former species, in which a deep rich blue occurs on the upper side of the female in association with wider orange bands on the secondaries. The male is also of a richer shade, and the marginal dark band of primaries is wider. On the under side, the ground color is of a darker gray than in the typical insect.

*Cottlei* occurs more commonly in the regions about the San Francisco Bay, but examples have been recorded in the lowlands of widely separated portions of California.

An aberration of this form was described by Watson and W. P. Comstock, as *labecula*. It differs from the typical insect in that the extra-discal rows of spots on the under side of wings are absent. No examples were procurable for illustration.

Illustrated. Plate 55. ♂ fig. 4; ♀ fig. 5; ♂ under side fig. 6.

THE LUPINE BLUE *(Plebejus acmon lupini* Bdv.) is a sierran race of *acmon*. It differs from the two forms above described, in having dark margins on the superior surface, which merge gradually into the blue. The orange line on upper side of secondaries is usually narrow, and may be formed by a series of crescents. The spots on the under surface are frequently smaller than in typical *acmon*.

On account of the high altitudes in which it occurs, *lupini* must be sought in late June and early July.

Illustrated. Plate 55. ♂ fig. 7; ♀ fig. 8; ♂ under side fig. 9.

CLEMENCE'S BLUE *(Plebejus acmon monticola* Clemence) is a race of *acmon* occurring in the southern Sierras. It is easily distinguished from other forms by the large size, and lustrous quality of the blue. The orange band is wide, and the spots on the under surfaces are well defined. The female has a rich suffusion of blue on the upper surfaces, whereas in other forms, this sex is relatively dark.

*Monticola* is common in the San Gabriel Mountains, in June.

Illustrated. Plate 55. ♂ (type) fig. 10; ♀ (type) fig. 11; ♀ under side, fig. 12.

THE PALLID BLUE *(Plebejus acmon monticola* ab. *pallida* Gunder) is an aberration of *monticola* in which the orange band of secondaries is of a pale pinkish-white. It is known at present only from the type.

Illustrated. Plate 55. ♀ (type) fig. 13.

MALCOLM'S ABERRANT BLUE *(Plebejus acmon monticola* ab. *malcolmi* Gunder) is another aberration of *monticola*, in which the orange band of secondaries is wide and diffuse, and extends forward onto the posterior portion of the primaries. It is exceedingly rare.

Illustrated. Plate 55. ♀ (type) fig. 14.

SKINNER'S BLUE *(Plebejus acmon chlorina* Skin.) occurs in a limited territory through the Tehachapi and Tejon Mountains.

In this form, the male is of a greenish shade on the upper side, but in all other respects resembles *acmon.* The female, which is found in association with this green male, cannot be distinguished from typical *acmon.*

*Chlorina* is a great rarity, on account of the isolation, and limited area, of its habitat. Late June, and early July, find it on the wing.

Illustrated. Plate 55. ♂ fig. 15.

CAROLYN'S BLUE *(Plebejus acmon chlorina* ab. *carolyna* Comst.) is an exceedingly rare variant of *chlorina,* in which the ends of the nervules on the upper side of primaries are striped with orange. It therefore combines a special characteristic of *neurona,* with the coloration of *chlorina.*

Illustrated. Plate 55. ♂ (type) fig. 16.

THE VEINED BLUE *(Plebejus neurona* Skin.) has one characteristic which separates it at once from its allies. This is the fact that the male is without a trace of blue. The ground color of both sexes, on the upper side, is a rich brownish-black.

The most striking feature of the species is the orange veining of the primaries, which is especially marked in the male. There is much variation in this feature, however. A series of females from Mt. Tehachapi demonstrates every gradation between examples that are indistinguishable from *acmon* females, (without a trace of orange veining on the primaries), and those in which the orange stripes extend entirely across the wing. *Neurona* is a rare insect, with a range extending from the southern end of the Sierra Nevadas, through the Tehachapis, and into the San Bernardino Mountains. It is found in isolated colonies, at high elevations, and never occurs in abundance. Early June is its favored season, and there is only a single brood.

Early Stages. Unknown. It is usually found in association with alpine species of Lupine, which may constitute the larval foodplant.

Illustrated. Plate 55. ♂ fig. 20; ♀ (atypical) fig. 21; ♀ fig. 22; ♂ under side fig. 23.

THE SAN EMIGDIO BLUE *(Plebejus emigdionis* Grin.) is a valid species, in spite of its having been confused with other forms by a number of workers. One of the distinguishing features of this butterfly is the character of the orange band of secondaries, which is not clearly defined as in *acmon,* but shows a blurred appearance, and gradually merges into the ground color. On the under side of primaries there are two lines of large submarginal black spots, running parallel with each other.

*Emigdionis* is a rare insect, occurring in isolated colonies on the lower Mojave plateau, and the southern edge of the San Joaquin Valley. It flies in May. The examples figured on Plate 55 have been compared with the types.

EARLY STAGES. Undetermined.

ILLUSTRATED. Plate 55. ♂ fig. 17; ♀ fig. 18; ♀ under side fig. 19.

## Genus PHILOTES Scud.

THE SQUARE-SPOTTED BLUE *(Philotes battoides* Behr) must be sought at high elevations in the central Sierras during mid-July. It is a highly polymorphic species, and has in consequence been subdivided into a number of geographic races, some of which are so similar in maculation as to be separated with difficulty.

Typical *battoides* may be distinguished from its near allies by the large quadrate black spots on the under side of both wings. It is fairly plentiful in its somewhat restricted range, from late June to early August.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 55. ♂ fig. 24; ♀ fig. 25; ♂ under side fig. 26.

THE OREGON BLUE *(Philotes battoides oregonensis* B. & McD.) is a northern alpine race of the former species, occurring in southern Oregon, and northeastern California.

It differs from the typical insect in its relatively larger size, and the reduction in spots of the under surface. The males have a wide dark marginal band on the superior surface.

The types were taken at Crater Lake, Oregon, in late July.

ILLUSTRATED. Plate 55. ♂ (compared with type) fig. 27; ♀ fig. 28; ♀ (paratype) under side fig. 33.

THE SAN BERNARDINO BLUE *(Philotes battoides bernardino* B. & McD.) represents a small southern race of *battoides*, which has its home in the Sierra Madre, San Gabriel, San Bernardino, and San Jacinto Mountains of southern California.

It is separated by the character of spots on the under surfaces, which are small, and clearly defined on a uniform whitish background. In size it is as small as *enoptes*, and is rather difficult to separate from it. The chief difference lies in the fact that the females of *bernardino* have a wide marginal orange band on the upper side of secondaries.

This dainty little butterfly is on the wing in June and July. A coastal race flies over the sand dunes of the southern beaches, in the spring, which is practically indistinguishable from *bernardino*. All of the races of *battoides* are found in association with *Eriogonum*, which may possibly constitute the larval food-plant.

Illustrated. Plate 55. ♂ fig. 29; ♀ fig. 30; ♂ under side fig. 31.

THE MT. BALDY BLUE *(Philotes battoides bernardino* ab. *baldyensis* Gunder) is a unique aberration of *bernardino* in which a large quadrate spot occurs on the under side of the primaries, as a result of the fusion of the black spots distal to the cell.

Illustrated. Plate 55. ♀ (type) under side fig. 32.

THE GLAUCOUS BLUE *(Philotes glaucon* Edw.) flies throughout the Great Basin and Rocky Mountain regions. In California it occurs in the Mono Basin, where it favors a desert environment.

In this species, the blue of the male is of a uniform shade, with a violet tinge. The marginal band is clear cut and even on both wings, and the ends of the nervules on the primaries are slightly darkened, giving a checkered appearance. The orange spots on the under side of secondaries are wider than in *enoptes*, and the black spots are a little heavier.

Early Stages. Undetermined.

Illustrated. Plate 55. ♂ fig. 34.

THE INTERMEDIATE BLUE *(Philotes glaucon intermedia* B. & McD.) represents a race of *glaucon* occurring at moderate elevations in northern California, the type locality being the upper Sacramento Valley of Shasta County. It is differentiated with difficulty from *enoptes.*

The upper surface of the male shows rather wide dark borders and the female has an orange band in the region of the anal angle. The spots of the under side are smaller than in *enoptes* or *oregonensis,* and the orange band is broken into lunules.

*Intermedia* flies in June and July, and is rare.

ILLUSTRATED. Plate 55. ♂ (paratype) under side fig. 35; ♀ fig. 36; ♂ fig. 37.

THE DOTTED BLUE *(Philotes enoptes* Bdv.) is widely distributed throughout the mountains of California and Oregon. The male is a pale purplish-blue on the upper side, with narrow, dark margins. The female is dark above, with occasionally a few faint orange lunules on the hind wings. Both sexes are a dull gray underneath, with numerous small round spots. There is a row of dull orange spots on the secondaries, close to the margin. The color of these is usually a little more dull than in any of the related forms.

*Enoptes* is difficult to separate from some of the races of *battoides.* There is a structural difference, in the shape of the genital armature, by means of which the specialist can differentiate, but the amateur seldom has the knowledge or equipment for such an examination.

EARLY STAGES. Unknown. The larvæ are presumed to feed on *Eriogonum.*

ILLUSTRATED. Plate 56. ♂ fig. 1; ♀ fig. 2; ♂ under side fig. 3.

THE RITA BLUE *(Philotes rita* B. & McD.) shows close relationship to *enoptes,* and may be merely a desert race of that species. The upper side of the male is of a slightly paler blue. The female has a wider orange band on the upper side of secondaries than is customary in *enoptes.*

This rare little blue is found on the southeastern portion of the Mojave Desert in California, and ranges into southern Arizona. Mojave specimens are usually small.

*Rita* should be sought, during April, in the district adjacent to Needles.

Early Stages. Unknown.

Illustrated. Plate 56. ♂ under side fig. 4; ♂ (compared with type) fig. 5; ♀ (compared with type) fig. 6.

THE SMALL BLUE *(Philotes speciosa* Hy. Edw.) has its habitat on the wind-swept central Mojave, far from the haunts of man.

In those rare seasons when this arid region has been favored with winter rains, there results a wealth of vernal decoration. Flowers spring up in great abundance, and for a few short days, the desert floor is a carpet of varicolored bloom. On these occasions, *speciosa* may be found in fair abundance.

The butterfly has a weak and inconspicuous flight, which would pass unnoticed by all save the skilled observer. It hovers a few inches above the ground, pausing occasionally to rest. Frequently the moving shadow of this tiny desert wraith may be more readily observed than is the insect itself.

The Mojave is a land of heavy winds. During the month of April, when *speciosa* is abroad, these cutting blasts begin about eleven o'clock in the morning. Collecting must therefore be done in the calmer early hours, or else in the late afternoon, when the blowing usually ceases, and the butterflies are settling to rest.

Early Stages. Unknown.

Illustrated. Plate 56. ♀ fig. 12; ♂ fig. 13; ♂ under side fig. 18.

THE SONORA BLUE *(Philotes sonorensis* F. & F.) appears in early February, and becomes abundant in favored localities, during March and April. Captures have been recorded in the mountains, as late as June. The species is characteristically a southern insect, but extends its range northward to central California, where it is rare.

It is only found in districts where the stonecrop grows, which accounts for the isolation of its colonies. In Los Angeles County it favors the lower mountain canyons. Further south it reaches the seacoast, in regions where the cliffs are rocky, and the peculiar plants on which it is dependent, find a foothold.

*Sonorensis* is the most gaudily colored of all the California blues. It is consequently in great demand for decorative purposes, and may some day become rare on account of the ease with which it is captured.

Early Stages. These have not been recorded in detail, although they have been observed by numerous workers.

Egg. Illustrated in Figure A63. Color, delicate pea-green, with a raised white network.

Caterpillar. Of the usual slug-shaped type. There is wide variation in the color and markings, ranging from a pale green to a mottled rose. The eggs are laid on the fleshy leaves of the food-plant, and the young larvæ burrow into the succulent substance, spending most of their time in this retreat.

Chrysalis. Brownish, and of the compact type characteristic of most Lycaenids. Pupation occurs on the ground, at the base of the plant, or under stones.

Larval food-plant. Species of *Sedum*.

Illustrated. Plate 56. ♂ fig. 7; ♀ fig. 8; ♂ under side fig. 9.

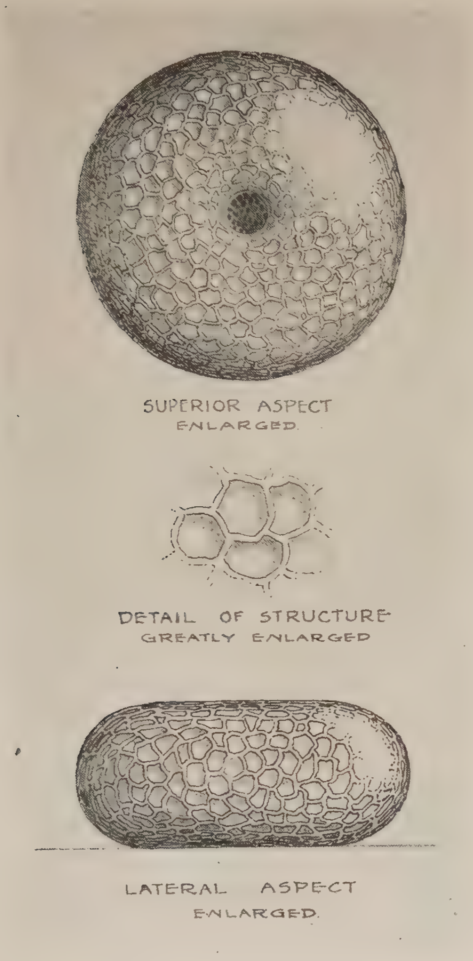


FIGURE A63
Highly Magnified
Egg of *Philotes sonorensis*

THE WHITE-SPOTTED SONORA BLUE (*Philotes sonorensis* ab. *sonoralba* Wats. & W. P. Comst.) is a rare aberration of the above species, in which the red spots of the primaries have been replaced by cream-white.

Illustrated. Plate 56. ♂ fig. 14.

THE CLOUDED SONORA BLUE *(Philotes sonorensis comstocki* Gunder) is a form of *sonorensis,* which differs markedly from the typical insect as will be observed by reference to the colored plate. It is rare.

Illustrated. Plate 56. ♂ (holotype) fig. 10; ♀ (allotype) fig. 11; ♂ under side fig. 15.

## Genus PHAEDROTES Scud.

THE ARROW-HEAD BLUE *(Phaedrotes piasus* Bdv.) has for many years been held in collections under the name *sagittigera,* but with the publication of the figures of Boisduval's types by Dr. Oberthur, the true status of *piasus* was established.

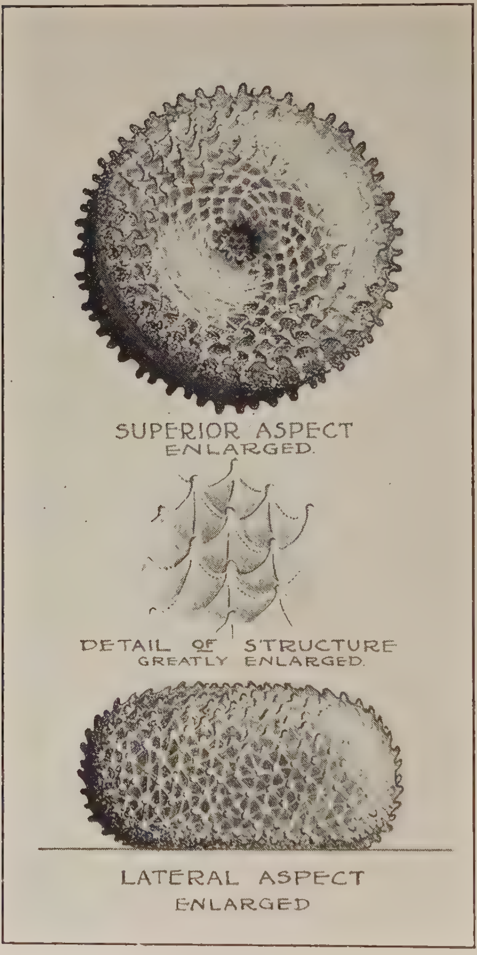


FIGURE A64
Egg of *Phaedrotes piasus,*
Highly Magnified

The species is not uncommon in the mountains of California and Oregon. In the northern portions of its range it is found at practically all elevations, but in the coastal districts of southern California, is replaced by a smaller, more distinctly marked race.

The period of flight varies with the altitude. In the Sierras it is on the wing in June and July, but throughout the lowlands it emerges earlier.

Early Stages. Undetermined.

Larval food-plant. Lupine.

Egg. Illustrated in Figure A64.

Caterpillar and chrysalis. Undescribed.

Illustrated. Plate 56. ♂ fig. 16; ♀ fig. 17; ♀ under side fig. 19.

THE CATALINE BLUE *(Phœdrotes piasus catalina* Reak.) is a southern race of *piasus*, which is distinguished by its smaller size, and darker ground color of the under surface. The white arrow-head spots stand out in strong contrast to the deep gray field. The fringes of this form are more heavily checkered at the ends of the nervules than in typical *piasus*.

This was formerly a very common species in the lowlands of Los Angeles County, but the gradual disappearance of the wild flowers along with the development of subdivisions is thinning out the colonies.

It is found during March and April, in association with fields of lupine.

ILLUSTRATED. Plate 56, ♂ fig. 20; ♂ under side fig. 21; ♀ fig. 22.

THE SAN GORGONIO ARROW-HEAD *(Phœdrotes piasus catalina* ab. *gorgonioi* Gunder) was taken on Mt. San Gorgonio, in the San Bernardino Mountains. It is a unique aberration of *catalina*, and differs from that insect in the enlargement and partial fusion of the spots on the under side of primaries.

ILLUSTRATED. Plate 56. ♂ (type) under side fig. 23.

### Genus GLAUCOPSYCHE Scud.

BEHR'S BLUE *(Glaucopsyche lygdamus behrii* Edw.) represents a local race of a widely distributed and highly polymorphic species, which has undergone marked modification in the various portions of its range.

The territory of *behrii* centers in Marin County, north of the San Francisco Bay district.

The male is a lustrous blue, with narrow dark margins above, and a series of uniform black spots on the under side, as shown in the colored figure. The female is dark above, with rarely a few blue scales in the basal portion of the wing.

*Behrii* flies from March to early May.

EARLY STAGES. Recorded in part by F. X. Williams, in the "Entomological News," Vol. 19, p. 482.

Egg. No description is available.

Caterpillar. When mature, body, pale coffee color, lighter below the spiracles. A reddish-brown line occurs in the median line, which has a purplish tinge. Oblique dashes, whitish. Sub-horizontal and horizontal bands, obscure. Lateral line white, becoming purplish ventrally. Body covered with roughened long pale hairs. Shield, grayish-green.

There is some variation in the color and markings of different individuals, as with most Lycaenid larvæ.

Chrysalis. Wood brown, with paler metathorax and wing covers. The form, and general distribution of the markings are similar to those of *antiacis*.

Larval food-plants. *Lotus, Lupinus* and *Astragalus*.

Illustrated. Plate 56. ♀ fig. 24; ♂ under side fig. 25.

THE SOUTHERN BLUE *(Glaucopsyche lygdamus australis* Grin.) is a small race of *lygdamus*, occurring in the mountains of southern California.

It may be distinguished from *behrii* by the reduction in size of the black spots on the under side of secondaries, and the greater amount of blue on the superior surface of the female.

In April and early May, the protected mountain valleys of Southern California put on their robes of azure lupine, and call forth a host of blues to pay them homage. *Australis* responds in generous numbers, as well it may in so heavenly an environment.

Early Stages. Unrecorded.

Illustrated. Plate 56. ♂ under side fig. 26; ♂ (type) fig. 28; ♀ fig. 29.

THE UNSPOTTED SOUTHERN BLUE *(Glaucopsyche lygdamus australis* ab. *sinepunctata* Comst.) is an aberrant form of the above species, in which the spots on the under side of secondaries are obsolete. In other respects it resembles the typical insect.

Illustrated. Plate 56. ♂ (type) under side fig. 27.

Another race of *behrii* has been separated by Dr. Skinner, under the name *columbia*, which occurs in the mountains of northern California, Oregon and Washington. It is even larger than *behrii*, and the ground color of the under side is lighter. No specimens were procurable for illustration.

THE XERCES BLUE *(Glaucopsyche xerces* Bdv.) has its habitat in the coastal regions centering in the San Francisco Bay district, where it flies in company with *polyphemus*. It is, in fact, a form of the latter insect, in which the black spots of the under side have disappeared, leaving large white dots, superimposed on a field of steel-gray.

For a number of years this butterfly was not observed, and it was thought to be extinct. Of late, it has reappeared in considerable numbers. On account of its restricted territory, it will always be something of a rarity. It flies in March and April.

Early Stages. Recorded in detail by F. X. Williams, in the "Entomological News," Vol. 19, p. 476.

Egg. Of the usual echinoid form, depressed at top, and micropyle in a pit. Covered by a raised white network, the meshes quadrilateral, and surmounted at each juncture by a short rounded process, which somewhat obliterates the delicate pale green ground color.

Caterpillar. When mature, covered with small piliferous whitish tubercles, and a few of a darker shade. Body, pale green; median line dark green; broad bordering line, yellowish green; oblique dashes distinct, and of a yellowish-green. Sub-horizontal and horizontal bands of the same color, but more obscure; the whitish spiracles running along the upper edge of the latter band. A lateral yellowish-white line, becoming pale lilac ventrally, and pale greenish toward the posterior segments. A pale greenish-yellow band on four prolegs. A long transverse plate on segment 10, with some dark tubercles. Eversible sacs whitish. Long hairs on each side of dorsum. Whole body covered with a whitish pile. The color and patterns are variable.

Chrysalis. Of the usual stout type. Thorax and wing cases, pale grayish-green. Abdomen, pale wood brown, minutely reticulate. A broad rusty-brown median line, narrowing on the mesothorax, where it is nearly black, and expanding again on the prothorax. A very fine greenish line runs through the dorsal band of the thorax. A number of additional spots and blotches are variously placed. There is variation in the intensity and color of the markings, some examples being quite pale.

See Plate 63, Figures 14 and 15, for larva and pupa.

Larval food-plant. *Lotus*.

Illustrated. Plate 56. ♂ under side fig. 30; ♂ fig. 31.

THE POLYPHEMUS BLUE *(Glaucopsyche xerces polyphemus* Bdv.) represents the normal form of *antiacis,* which, in turn, is only a variant of *xerces.*

The butterfly enjoys a wide range throughout northern California, where it occurs on the plains and in the mountains. It is a smaller insect than *xerces,* and is characterized by a series of minute black dots encircled with white, on the under side. The ground color is light gray.

*Polyphemus* is on the wing in March and April.

Early Stages. These are given under *xerces,* since the two forms are merely phases of the same insect.

Illustrated. Plate 57. ♂ fig. 1; ♂ under side fig. 2.

THE EYED BLUE *(Glaucopsyche xerces* ab. *antiacis* Bdv.) is merely an obnormal form of *polyphemus,* in which the spots on the under side are larger, and the ground color a darker shade of gray. The borders above are wider than in the typical insect.

Illustrated. Plate 57. ♂ under side fig. 3.

THE MERTILA BLUE *(Glaucopsyche xerces mertila* Edw.) is another form of that highly variable insect, *xerces.* It differs from *antiacis* only in the presence of a long white dash running through the cell of the under side of primary.

Many intergrades between *mertila, polyphemus,* and *antiacis* will be found, which demonstrates the fact that they are all variants of one plastic species.

Illustrated. Plate 57. ♂ under side fig. 4.

HUGUENIN'S BLUE *(Glaucopsyche xerces mertila* ab. *huguenini* Gunder) is an aberrant *mertila,* in which the spots on the under side are enlarged and elongated.

Illustrated. Plate 57. ♂ (type) under side fig. 5.

## Genus LYCÆNOPSIS F. & F.

THE ECHO BLUE *(Lycænopsis pseudargiolus echo* Edw.) represents a California race of *pseudargiolus.* The parent insect is common and exceedingly variable with an extensive range through North America, in consequence of which a long list of named forms and seasonal variations occurs. Fortunately only two or three of these are found in California.

*Echo* is the predominant form of the early spring, in the lowlands, where it is sometimes observed in late January or February. By the middle of April it is on the wing in abundance, particularly in the lower mountain canyons. The later examples represent a second brood.

Early Stages. These have been recorded for typical *pseudargiolus,* and probably differ so slightly for the various races as to serve for the entire group. They are admirably figured in Edwards' "Butterflies of North America."

Egg. Turban shaped; pea green, studded with pale prominences.

Caterpillar. The predominant form is greenish, but there is wide variation in the color and markings of different individuals.

Chrysalis. Of the usual plump and ovoid shape. Color, brownish.

Larval food-plants. A wide range of flowering shrubs and plants, including dogwood, bugbane, wild bean, meadow-sweet, California lilac, *Actinomeris* and *Hosackia.*

Illustrated. Plate 57. ♂ fig. 6; ♂ under side fig. 7; ♀ fig. 8.

THE ARIZONA BLUE *(Lycaenopsis pseudargiolus arizonensis* Edw.) is a form of *pseudargiolus* which is occasionally encountered at high elevations in the mountains.

It is more heavily bordered with black in both sexes than is the case with *echo.* The specimen shown in the colored plate is an extreme example in which the secondaries are much more obscured than is usual.

The Arizona Blue is on the wing at a later period than *echo,* as a result of the higher altitudes in which it develops. June and July are its favored months.

In the state of Arizona, where this race is common, there occurs an earlier brood of somewhat different aspect, which has been named *cinerea* by Edwards. The same condition may obtain in the alpine regions of California. Lepidopterists are urged to conduct breeding experiments with these mountain forms, as an aid to better understanding of the subject.

Illustrated. Plate 57. ♀ fig. 9.

## Superfamily HESPERIOIDEA

THE second great division of the butterflies, known as the GRYPOCERA or HESPERIOIDEA, is composed of small or medium sized insects which show a remarkable uniformity of structure throughout the group. Their wing expanse is restricted in comparison with the size of the body, and hence in flight the wing stroke is much more rapid. This may account for the characteristic skipping motion which these butterflies show when on the wing, and which has led to their designation as Skippers.

America is the home of the greater number of species, and the tropics finds a remarkable elaboration of forms. In certain districts of South America more than half of the butterfly species are Skippers. As the boreal regions are approached there is a marked decrease in the number of Hesperids.

The family is poorly represented in California, there being only fifty distinct species thus far recorded. These fall into two major groups or families, the HESPERIIDÆ and MEGATHYMIDÆ.

The first group, comprising the true Skippers, is again divided into two subfamilies, the URBANINÆ and the HESPERIINÆ.

The former are all more or less dark and inconspicuous in color, and in several of the genera, are exceedingly difficult to classify.

Many of the members of this subfamily hold their wings in the horizontal or open position when at rest. In contrast to this, the HESPERIINÆ more frequently rest with the upper wings folded over the thorax, and the hind wings spread flat. The colors of the last named group are predominantly shades of brown or yellow.

Nearly all of the Skippers are fond of flowers and sunshine.

The caterpillars of most Hesperids are devoid of hair, or fleshy prominences, and have the habit of forming a tent or shelter out of the leaf on which they are feeding.

## Family Hesperiidae

## THE SKIPPERS AND ALLIES

THIS group of butterflies is of little interest to the amateur, on account of the lack of color and inconspicuous nature of its component members. In certain genera, (particularly *Erynnis*) the matter of classification is almost impossible without resorting to rather technical studies of the genitalia.

All the members of the group are rapid flyers, but their habit of feeding on flowers of many varieties, and also of drinking from moisture-laden spots, makes them fairly easy of capture.

### Subfamily Urbaninae

#### Genus POLYGONUS Hbn.

SKINNER'S ARIZONA SKIPPER *(Polygonus lividus arizonensis* Skin.) has occasionally been taken in the desert areas adjacent to the Mexican and Arizona borders. It is a rarity throughout its entire range.

Early Stages. Unknown.

Illustrated. Plate 57. ♂ fig. 10; ♂ under side fig. 11.

#### Genus EPARGYREUS Hbn.

THE SILVER-SPOTTED SKIPPER *(Epargyreus tityrus* Fabr.) is recorded from nearly every faunal zone of California, but is never taken in abundance in this state. It is a widely distributed insect, ranging south as far as Panama, and eastward to the Atlantic seabord.

The flight of this butterfly is rapid, but it pauses frequently to sample the nectar of flowers. At rest its wings are held half open. There are two or three broods in California, resulting in captures throughout the greater part of the year.

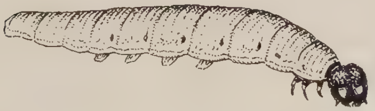


FIGURE A65
Larva of *Epargyreus tityrus*, Enlarged

Early Stages. Fully described in Scudder's "Butterflies of New England."

Egg. Domed; heavily ribbed and cross-lined. Color, leaf-green, with a bright red spot at tip.

Caterpillar. Head large, and seemingly out of proportion to the body; ferruginous, with two large orange spots. Body, lemon-green, transversely banded with darker green. It constructs a shelter by uniting the edges of leaves, which serves as a protection during the day. At night it crawls out of this abode to feed. See Figure A65.

Chrysalis. Chestnut color, with occasionally a few dark markings. Pupation usually occurs on the ground in a loosely constructed shelter.

Larval food-plants. Wistaria, locust, wild bean, *Desmodium*, and a number of other plants.

ILLUSTRATED. Plate 57. ♂ fig. 12; ♂ under side fig. 13.

THE EXADEUS SKIPPER *(Epargyreus exadeus* Cram.) has been reported for the state, but the records are open to question. It differs markedly from *tityrus* on the under side, particularly as regards the silver marks on the secondaries, which are broken into several small spots, instead of being in a continuous band. In Mexico it is a common butterfly, but only an occasional stray specimen is taken in the United States.

EARLY STAGES. Briefly described in Seitz "Macrolepidoptera of the World."

ILLUSTRATED. Plate 57. ♂ fig. 14.

### Genus GONIURUS Hbn.

THE LONG-TAILED SKIPPER *(Goniurus proteus* L.) is common on occasion in southern California, but its occurrence is sporadic. Tulare County is the most northerly point at present recorded for the species on the west coast. It reaches southward into the tropics, and eastward to the Atlantic seaboard.

The long tails and greenish tint of the upper surface, will serve to differentiate it from other forms.

There is evidently a succession of broods, as it has been observed from early summer to late fall.

Early Stages. Recorded in detail by Scudder and others.

Egg. Of the usual domed and ribbed form.

Caterpillar. Greenish, with a fine dark dorsal line and a yellow subdorsal stripe. A pale green line runs along the base of the body. Between these lines are transversely arranged segmental areas of gray, dotted with black and yellowish. There is frequently a reddish tinge on the posterior portions.

Head, large and slightly depressed at the top; brown, with a yellow spot on each side of the mouth. See Figure A66a.

Chrysalis. Covered with a white powder, which somewhat obscures the brownish color. For larva and pupa see Figure A66.

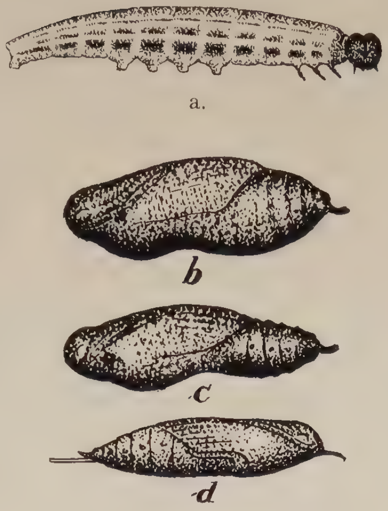


FIGURE A66

a. Caterpillar of *Goniurus proteus*
b. Chrysalis of *Epargyreus tityrus*
c. Chrysalis of *Goniurus proteus*
d. Chrysalis of *Calpodes ethlius*

Larval food-plants. Cultivated beans, Wistaria, Mesquite, *Phaseolus* and *Clitoria*.

Illustrated. Plate 57. ♂ fig. 16; ♂ under side fig. 15.

RAUTERBERG'S SKIPPER *(Goniurus dorantes rauterbergi* Skin.) is doubtfully credited to southern California. It may possibly drift across the border from its native state of Arizona.

The shorter tails, and lack of greenish luster on the upper surface, will serve to distinguish it from *proteus*.

Early Stages. Unrecorded.

Illustrated. Plate 57. ♂ under side fig. 17.

## THE DUSKY-WINGS. Genus THORYBES Scud.

THE MEXICAN DUSKY-WING *(Thorybes mexicana* H. S.) occurs in the mountains throughout the greater part of the state, but is uncommon in the north. It is probably double brooded, as records are available for the spring and summer months. The colored figures will serve to differentiate it.

*Mexicana* has frequently been confused with the eastern *pylades*, but the latter insect is probably not represented on the Pacific coast, unless it be in more northern districts.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 58. ♂ fig. 1; ♀ under side fig. 2.

THE NEVADA DUSKY-WING *(Thorybes nevada* Scud.) has its habitat in the Arctic-alpine and Hudsonian Zones of the California and Nevada mountains, and the high plateaus of southeastern Oregon and northeastern California. It is not uncommon in the high Sierras, but is still somewhat rare in collections.

The smaller size, and grayish mottling of the under surfaces of this species will serve to distinguish it from *mexicana*. It is on the wing in midsummer.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 58. ♂ fig. 3; ♀ fig. 4; ♂ under side fig. 5.

## THE CHECKERED SKIPPERS. Genus URBANUS Hbn.

THE TWO-BANDED SKIPPER *(Urbanus ruralis* Bdv.) ranges through the higher mountains of the Pacific states, and eastward to the Rockies, but is nowhere common. It is listed as *caespitalis* in the majority of collections. June to August represents its season.

The dark coloration, and heavily checkered fringes, will serve to distinguish it from other nearly related forms.

Early Stages. Unknown, except for the fact that the larvæ feed on the tender centers of *Potentilla tenuiloba.*

Illustrated. Plate 58. ♂ fig. 6; ♀ fig. 7; ♂ under side fig. 8.

THE SMALL CHECKERED SKIPPER *(Urbanus scriptura* Bdv.) is a rare species that has been occasionally reported from various points in the state. It is taken more plentifully in the Rockies, from Montana, through Colorado and into New Mexico. It occurs also in Arizona.

The small size, darker secondaries and light under surfaces are characteristic features of this butterfly.

Early Stages. Unknown.

Illustrated. Plate 58. ♂ fig. 9; ♀ fig. 10; ♂ under side fig. 11.

THE WESTERN CHECKERED SKIPPER *(Urbanus tessellata occidentalis* Skin.) occurs in great abundance throughout the entire state. The species is especially common in the lowlands around cultivated areas, due probably to the great prevalence of that widely distributed weed, the common mallow. Vacant lots about townsites, even in thickly populated centers, are sure to have their coterie of *occidentalis.* It is a western race of the common eastern *tessellata,* and can be distinguished from it only by the slightly different structure of the genitalia, and the somewhat paler aspect.

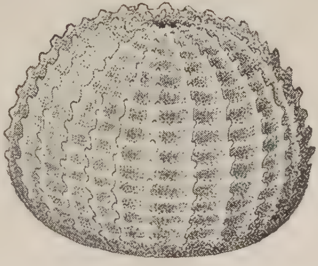


FIGURE A67
Egg of *Urbanus tessellata occidentalis*
Highly Magnified

It flies throughout the greater part of the year, and is multiple brooded.

Early Stages. Egg. Shown in Figure A67. Color, greenish-white.

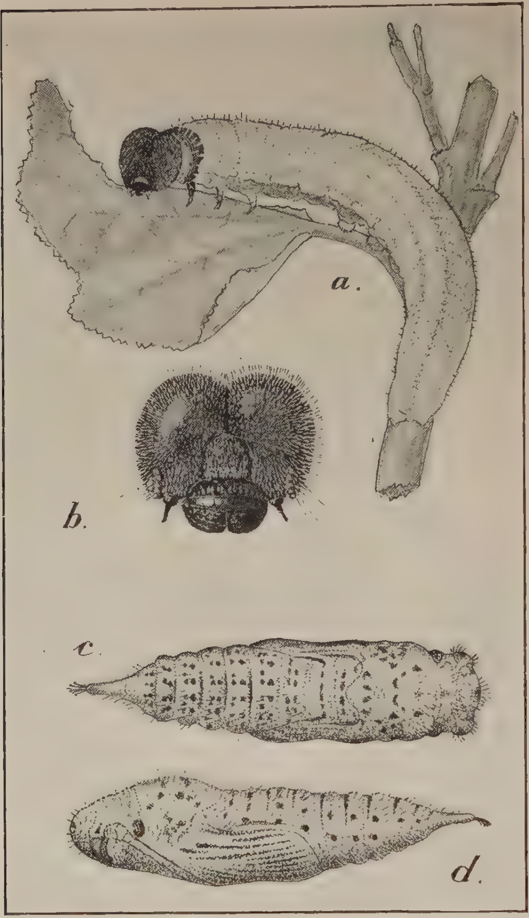


FIGURE A68
EARLY STAGES OF *Urbanus tessellata occidentalis*
a. CATERPILLAR ON MALLOW, ENLARGED.
b. HEAD OF CATERPILLAR, MUCH ENLARGED.
c. CHRYSALIS, DORSAL VIEW, ENLARGED.
d. CHRYSALIS, LATERAL VIEW, ENLARGED.

Caterpillar. Yellowish-white, with a delicate gray-green dorsal and subdorsal line. Minutely pilose. Head, black, thickly covered with gray-white hair. Neck, constricted, and lighter in shade than the expanding collar of the first thoracic segment. The latter is brownish-black, and bears a number of whitish processes. Like most skipper larvæ, it rolls a protective nest out of the leaf on which it is feeding. Illustrated in Figure A68.

Chrysalis. Light brown, or greenish-brown, with numerous dark brown spots and stripes, disposed as shown in Figure A68 c and d.

Larval food-plants. Common mallow or cheese-weed, and wild hollyhock *(Sidalcea)*.

ILLUSTRATED. Plate 58. ♂ fig. 12; ♀ under side fig. 13.

SKINNER'S ABERRANT SKIPPER *(Urbanus tessellata occidentalis* ab. *skinneri* Gunder) is a unique described by Jean Gunder in the "Entomological News" of February, 1927, Vol. 38.

The type is figured.

ILLUSTRATED. Plate 62. ♀ fig. 7.

THE LARGE WHITE SKIPPER *(Urbanus ericetorum* Bdv.) ranges through the mountains of the southern half of the state. Its chief citadel seems to be in the Upper Sonoran Zone of the southern Sierras, where it is occasionally seen in considerable numbers.

Its rapid flight makes it difficult to capture, hence it is something of a prize from the collector's standpoint.

There are a number of broods in the season, and it is therefore on the wing throughout the greater portion of the year.

EARLY STAGES. Recorded in detail by Karl Coolidge, in the "Entomological News" of May, 1923.

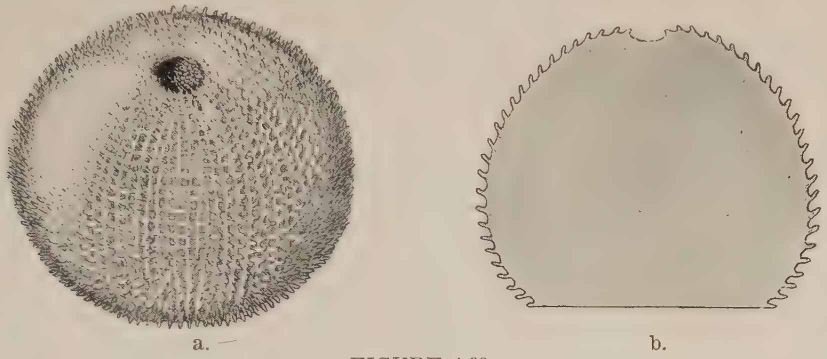

a. b.

FIGURE A69
EGG OF *Urbanus ericetorum*, HIGHLY MAGNIFIED
a. SIDE VIEW, SLIGHTLY TIPPED TO SHOW MICROPYLE
b. SECTION THROUGH EGG, AT CENTER

Egg. Nearly spherical; ribbed transversely and longitudinally, with blunt spines arising from the junctures, as shown in Figure A69. Color, at first a pale yellow, changing to a crystalline white.

Caterpillar. Pale greenish-yellow, with a narrow interrupted greenish dorsal line, and two lateral lines of similar character. Covered with short white pile. See Figure A70a.

Chrysalis. Shown in Figure A70b. Color, yellow-mahogany, covered with a bluish-white dusting. Abdominal segments, dull pinkish. Cremaster, dull black.

Larval food-plants. Numerous species of *Malvaceæ,* especially the bush-mallows. Also pigweed *(Amaranthus).*

ILLUSTRATED. Plate 58. ♂ fig. 14; ♀ fig. 15; ♂ under side fig. 16.

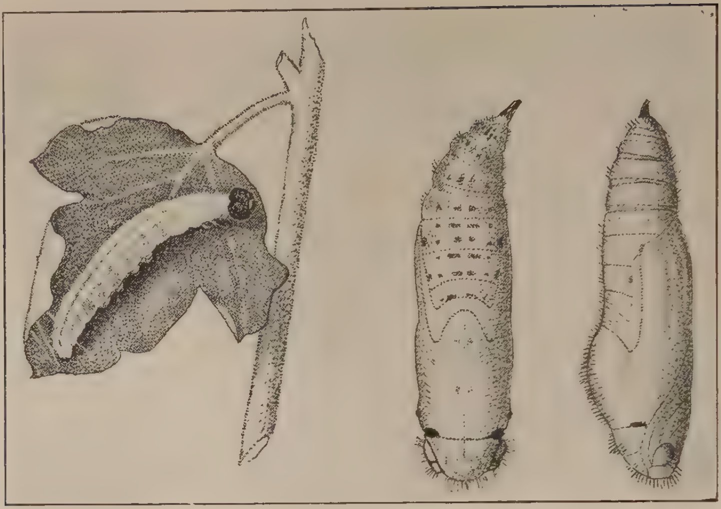


FIGURE A70
EARLY STAGES OF *Urbanus ericetorum*
a. CATERPILLAR ON BUSH MALLOW, NATURAL SIZE
b. CHRYSALIS, DORSAL AND LATERAL VIEWS, ENLARGED

### Genus ANTIGONUS Hbn.

THE POWDERED SKIPPER *(Antigonus pulverulenta* R. Feld.) frequents the desert areas of the southern tier of counties, and ranges from thence through southern Arizona to Guatemala. It is a great rarity in this state.

There are two broods, with captures recorded for the spring and fall months.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 58. ♂ fig. 17; ♂ under side fig. 18.

### THE SOOTY-WINGS. Genus PHOLISORA Scud.

THE ALPHEUS SOOTY-WING *(Pholisora alpheus* Edw.) occurs in the lower Coachella and Imperial Valleys and the desert lands adjacent to the Colorado River. It is rare in California, but seems to be somewhat more common in portions of Nevada, Arizona and New Mexico.

The small size, and centrally placed row of whitish spots on the under side of secondaries will serve to differentiate *alpheus.*

EARLY STAGES. Unrecorded.

ILLUSTRATED. Plate 58. ♂ fig. 19; ♀ fig. 20; ♂ under side fig. 21.

THE MOJAVE SOOTY-WING *(Pholisora libya* Scud.) is one of the common skippers of the southern deserts, being especially abundant in the lower Coachella Valley. It occurs throughout the Colorado Desert and the Mojave plateau. Examples are occasionally taken in the Owen's Valley, and the insect will not unlikely be later recorded from the Mono Basin. Northern specimens average somewhat larger than the typical form.

*Libya* is double brooded in the southern part of its range, where it flies through March and April, and again in October. It may be distinguished by the whitish fringes, and large white spots on the under side of secondaries.

Early Stages. Unknown.

Illustrated. Plate 58. ♂ fig. 23; ♀ fig. 24; ♂ under side fig. 22.

THE SOOTY-WING *(Pholisora catullus* Fabr.) occupies a vast territory, including all of the temperate regions of North America. It is never abundant in California, but has been taken sparingly in all portions of the state. There are two broods in the southern counties, but in the Gulf states it is reported as being triple brooded. Western examples frequently have a well defined submarginal line of white spots on the secondaries, as shown in Figure 26 of Plate 58.

Early Stages. These were described by W. H. Edwards in the "Canadian Entomologist," Vol. 17, p. 245, and are also discussed by Scudder in the "Butterflies of New England."

Egg. Conical, with a flattened base; top truncated, 8 or 9 lobed; sides marked by 15 vertical ribs. Color, pale yellow-brown.

Caterpillar. When mature, yellow-green, covered with small whitish tubercles, topped with short white hairs. A faint subdorsal yellow stripe is present. There is some variation in the color and markings of different individuals. The larva conceals itself in the usual manner, during the day.

Chrysalis. Greenish-yellow to brownish, covered with a mealy dust.

Larval food-plants. Lamb's quarters *(Chenopodium)*, pigweed *(Amaranthus)*, snowberry, *Ambrosia* and *Monarda.*

Illustrated. Plate 58. ♂ fig. 25; ♂ (variant) fig. 26; ♂ under side fig. 27.

## THE DUSKY-WINGS. Genus ERYNNIS Schr.

WRIGHT'S DUSKY-WING *(Erynnis lacustra* Wright) is an exceedingly rare member of this somber genus, which has been recorded from widely separated areas throughout the state. Southern captures have all been made in mountainous districts, but in the north it evidently occurs at lower altitudes.

The distinguishing feature of this butterfly is the extra-discal black line crossing the forewing, and the row of small points between the previously mentioned line and the apex. It flies from May to July.

The specimen used as an illustration is from the Grinnell collection, and was marked ♀ type *callidus.* Authorities have determined by a careful examination that it is a ♂ *lacustra.*

Early Stages. Unknown.

Illustrated. Plate 59. ♂ fig. 1.

THE AFRANIUS DUSKY-WING *(Erynnis persius afranius* Lint.) occurs sparingly throughout the state. It is evidently double brooded, as captures are on record from late spring to fall.

The species is somewhat smaller than typical *persius,* and is rather distinctly marked and gray powdered. The fringes are pale, sometimes almost white at their tips.

Early Stages. These have been recorded for typical *persius* and probably vary so little for the races *afranius* and *pernigra* as to serve for all three of the forms.

Egg. Subspherical, with a broad base, and from 11 to 14 rather high and stout vertical ribs. Color, at first yellowish-green, later changing to a blood-red.

Caterpillar. When mature, body plump, pale green, and briefly pilose. Head, ferruginous.

Chrysalis. Dull green. It is seldom observed on account of its protective semi-cocoon.

The complete life history of *persius* is recorded by Scudder in the "Butterflies of New England," from which the above brief account is extracted.

Larval food-plants. Willow, poplar and clover.

Illustrated. Plate 59. ♂ fig. 2; ♀ fig. 3; ♂ under side fig. 4.

GRINNELL'S DUSKY-WING *(Erynnis persius pernigra* Grin.) is a small, dark race of *persius,* which has its locus in the district north of the San Francisco Bay, the type locality being Mt. Tamalpais. It is almost an immaculate black on both surfaces. Little is known of its habits, and it is at present counted a great rarity.

Illustrated. Plate 59. ♂ fig. 5; ♂ under side fig. 6.

THE ARTFUL DUSKY-WING *(Erynnis callidus* Grin.) ranges through the mountains of the Pacific Coast states. It is an inconspicuously marked insect, with dark fringes, and a few small light spots on the primaries, lateral to the cell.

Captures are reported from April to August.

Early Stages. Unknown.

Illustrated. Plate 59. ♂ fig. 7; ♂ under side fig. 8.

JUVENAL'S DUSKY-WING *(Erynnis juvenalis* Fabr.) is a common species of the eastern states, and there is some doubt as to whether its range includes California. A few northern examples seem to answer the description of *juvenalis.*

The species is very close in general appearance to *propertius,* but there is a marked difference in the genitalic armature. The browner coloration will help in separating it.

Early Stages. Recorded in detail by Scudder in the "Butterflies of New England."

Egg. Subspherical, with a broad base, and about 16 vertical ribs. Color, pea-green, changing to salmon-red.

Caterpillar. Plump, and naked, tapering toward both ends, and of a whitish-green color. The head is large, rounded, and of a dirty green or fawn color, with orange marks on the sides. The larva constructs the usual covering of leaves as a protective enclosure.

Chrysalis. Plump, and without prominences. Color, dusky green, with a few inconspicuous blotches.

Larval food-plants. Oak, and also a number of Leguminous genera, such as *Lathyrus.*

Illustrated. Plate 59. ♂ fig. 9; ♀ fig. 10; ♂ under side fig. 11.

PROPERTIUS DUSKY-WING *(Erynnis propertius* Scud. & Burg.) represents the common large Dusky-wing of the West Coast. It is distinguished from *juvenalis* by the hairy gray vestiture, and the different shape of the genitalia.

*Propertius* flies from March to August.

Early Stages. Unknown.

Illustrated. Plate 59. ♂ fig. 12; ♀ fig. 13; ♂ under side fig. 14.

THE MOURNFUL DUSKY-WING *(Erynnis tristis* Bdv.) may be distinguished from all other members of the genus occurring in California (except *funeralis*) by the white fringes of the secondaries. It differs from the Funereal Dusky-wing in having shorter primaries, with the markings more distinct.

*Tristis* has been recorded from all regions of the state, but in the southern counties is much less common than *funeralis.*

Wright's error in showing a male *juvenalis* as *tristis* is responsible for several mistakes in reporting this species.

Early Stages. Unknown.

Illustrated. Plate 59. ♂ fig. 15.

THE FUNEREAL DUSKY-WING *(Erynnis funeralis* Scud. & Burg.) is the most abundant member of the genus in southern California, and ranges from thence south to Colombia. On account of Wright's error in showing a female of this species as *clitus*, it is difficult to ascertain from published records the limits of its range into the northern part of the state. It probably extends well beyond the central counties. Most of the records of *clitus* in California probably refer to this species.

The butterfly is exceedingly fond of the blossoms of hoarhound, and is easily captured when feeding. It is on the wing from late February to October.

*Funeralis* may be distinguished from *tristis*, its nearest ally, by the somewhat blurred markings, and the more elongate forewings. The white fringes of the secondaries are a conspicuous feature.

Early Stages. Recorded in detail by Karl Coolidge, in the "Journal of the N. Y. Entomological Society," Vol. 31, p. 175.

Egg. Subspherical, the base flat, and sides narrowing upwards only slightly except at the summit, which is rather broadly rounded. Longitudinally ribbed with 12 to 16 high ridges, running from base nearly to micropyle; between them, delicately raised cross ribs. At the juncture of these a beaded appearance is evidenced. Surface of egg covered with fine rounded raised cells. Color, at first almost white, changing through green, yellow, orange, to a deep brown just before hatching.

Caterpillar. Color, pale green, yellowish in the depressions, with a pale yellowish bloom to the surface, caused by minute hairs. There is a fine dark green dorsal line, and a pale yellow lateral line. Ventral surface, blue.

Chrysalis. Vivid green; wing cases clouded with a yellowish-white shade. Entirely covered with pale hairs. Suspended by a median girdle.

Larval food-plants. Alfalfa, burr-clover, *Nemophila* and probably *Hosackia*.

Illustrated. Plate 59. ♂ fig. 16; ♀ fig. 17; ♂ under side fig. 18.

## Subfamily Hesperiinae

### THE TRUE SKIPPERS. Genus PAMPHILIDIA Lind.

THE ARCTIC SKIPPER *(Pamphilidia palaemon* Pall.) is not a well established California species. A few strays have been recorded in the northern counties, and an occasional capture made in high altitudes of the Sierras. It is distinctly a boreal species, and is at home in the land of glaciers and long winters. Its range extends northward to Alaska and southern Labrador.

EARLY STAGES. Recorded in part by James Fletcher, in the "Canadian Entomologist," Vol. 21, p. 113.

Egg. Pale greenish-white, hemispherical, faintly grooved vertically, and densely pitted with deep pores.

Caterpillar. When mature, glaucous green, with several pale longitudinal stripes. Entire body covered with small piliferous papillae.

Chrysalis. Undescribed.

Larval food-plants. Grasses.

ILLUSTRATED. Plate 60. ♂ fig. 1; ♂ under side fig. 2.

### Genus COPAEODES Edw.

HEWITSON'S SKIPPER *(Copaeodes aurantiaca* Hew.) frequents the desert areas of the state, from Riverside County south to the border, and on into Arizona, Texas and Mexico. The unicolorous yellow under surface will serve to distinguish it.

Captures are recorded from April to September.

EARLY STAGES. Nothing is known of these, save that the larva feeds upon Bermuda grass, and probably also other grasses.

ILLUSTRATED. Plate 60. ♂ fig. 3; ♀ fig. 4; ♂ under side fig. 5.

## Genus PSEUDOCOPAEODES Skin. & Wms.

THE EUNUS SKIPPER *(Pseudocopaeodes eunus* Edw.) is one of the rarer desert skippers, ranging from the Mono Basin south through Owens Valley to the Mojave and Colorado Deserts. It also ascends the eastern slopes of the Sierras in semi-arid regions, and extends over into the southern San Joaquin Valley. Northern examples are of larger size.

The species may be double brooded in the lower deserts, but the recorded captures in June and July on the higher plateaus and in the mountains suggests a single summer brood in these altitudes.

The dark borders of the superior surface and the striated appearance of the under side will serve to distinguish *eunus*.

Early Stages. Unknown.

Illustrated. Plate 60. ♂ fig. 6; ♀ figs. 7 and 8; ♀ under side fig. 9.

## Genus HESPERIA Fabr.

MORRISON'S SKIPPER *(Hesperia morrisoni* Edw.) has been doubtfully credited to southern California. It is an exceedingly rare butterfly, which in all likelihood does not range far from its home in Colorado.

The distinguishing feature of *morrisoni* is the white elongate bar in the cell of the under side of secondaries.

In its native state it flies in May.

Early Stages. Unknown.

Illustrated. Plate 60. ♂ under side fig. 10.

THE COLUMBIA SKIPPER *(Hesperia columbia* Scud.) is another rare Hesperid of the far west. It has been recorded from various districts throughout the state. Wright rechristened it *californica,* his specimens (shown as figures 423 b and c of Plate XXXI) being reported from southern California. No similar examples have been observed in several years of collecting since his time.

The distinguishing feature of this skipper is the small straight bar and discrete point of under side of secondaries, as shown in the colored figure.

*Columbia* flies in April and October.

Early Stages. Unknown.

Illustrated. Plate 60. ♂ under side fig. 11; ♀ fig. 12.

THE IDAHO SKIPPER *(Hesperia comma idaho* Edw.) ranges from northeastern California to Canada. It represents a race of *comma*. The latter skipper has been separated into a large number of races, only two of which reach California.

*Idaho* may be distinguished by the whitish aspect of the under side of secondaries, with the lustrous white spots disposed as shown in the colored figure.

It flies in July and August.

Early Stages. Unknown.

Illustrated. Plate 60. ♂ fig. 13; ♀ fig. 14: ♀ under side fig. 15.

THE OREGON SKIPPER *(Hesperia comma oregonia* Edw.) is an obscurely marked race of *comma*, which ranges from California and Nevada northward to Canada. It is dull colored on the under surface, with a few inconspicuous yellow marks on the secondaries. The example pictured on the plate was taken in the Coachella Valley, which is probably far south of its normal range.

*Oregonia* is not a common butterfly, and little is known of its habits.

Illustrated. Plate 60. ♂ under side fig. 19.

THE JUBA SKIPPER *(Hesperia juba* Scud.) is a large clearly marked species, which ranges from California and Oregon through Nevada and Utah to Colorado. It is widely distributed in the state, and is not uncommon.

The distinguishing feature of *juba* is the uniform coloration of the under side of secondaries, on which the white spots, disposed as shown in the figure, stand out in bold relief.

There are evidently two broods, as captures are recorded for the spring and fall.

Early Stages. Unknown.

Illustrated. Plate 60. ♂ fig. 16; ♀ fig. 17; ♂ under side fig. 18.

THE GREEN SKIPPER *(Hesperia viridis* Edw.) may be distinguished from its near relatives by the under surface of the secondaries, in which the ground color is overcast with green on the anterior two-thirds, while the anal third is a rich yellow. The spots are a lustrous white.

The species is widely distributed through the mountains of California and ranges eastward through Arizona and New Mexico to Texas and Colorado.

Captures are recorded from June to September.

Early Stages. Unrecorded.

Illustrated. Plate 60. ♂ fig. 20; ♀ under side fig. 21; ♀ fig. 22.

THE NEVADA SKIPPER *(Hesperia nevada* Scud.) is a darker form than others of this closely related series. The spots on the under side of secondaries are large and are distributed over the surface in rather evenly spaced patches.

The species ranges from the Mono Basin of California southeastward to Arizona, and north to Canada.

It flies in July and August.

Early Stages. Unknown.

Illustrated. Plate 60. ♂ fig. 23; ♀ fig. 25; ♀ under side fig. 24.

THE RUSTIC SKIPPER *(Hesperia ruricola* Bdv.) occurs in the mountains throughout the state, being fairly abundant in the Tehachapis. It may not be represented in the coast ranges. It is rather a light form with a preponderance of yellow on the upper surfaces. The spots on the under side are not lustrous as in many of the previously considered species.

*Ruricola* flies from June to August.

Early Stages. Unknown.

Illustrated. Plate 61. ♂ fig. 1; ♂ under side fig. 2; ♀ fig. 3.

## Genus HYLEPHILA Billb.

THE FIERY SKIPPER *(Hylephila phylaeus* Dru.) is an exceedingly abundant butterfly throughout the lowlands of southern California. Its range extends northward to the San Francisco Bay district, southward to Argentina, and east to the Atlantic coast. The butterfly is a familiar sight about the lawns of residential districts and public parks.

The colored illustration is sufficient to distinguish it from other skippers. One of the noteworthy features is the marked difference of the sexes.

*Phylaeus* flies from late spring to November or December.

Early Stages. Recorded in great detail by Karl Coolidge in the "Transactions, American Entomological Society," Vol. 50, p. 319.

Egg. Hemispherical, sharply flattened at the base. Surface, smooth to the naked eye, but under high magnification, minutely punctate with a delicate tracery or network. Color, pale bluish-green.

Caterpillar. When mature, dirty yellowish-brown or gray-brown, with dorsal and dorso-lateral prominent brown stripes. Head, black, corrugated and bearing reddish-brown stripes and a few fine hairs. Collar, brown-black, pallid anteriorly.

Chrysalis. Yellowish-brown in the average specimen. A prominent black dorsal line extends from head case to posterior extremity. Parallel to this line on the thorax are two prominent black dashes. A number of black spots are usually present on the abdomen. The wing cases are of a livid hue, with inconspicuous veining. The pupa is thickly covered with sharp hairs, arising from low reddish-brown tubercles.

Larval food-plants. Grasses, especially Bermuda grass.

Illustrated. Plate 61. ♂ fig. 4; ♀ fig. 5; ♂ under side fig. 6.

### Genus OCHLODES Scud.

THE WOODLAND SKIPPER *(Ochlodes sylvanoides* Bdv.) is an exceedingly common skipper of the Pacific Coast states, where it ranges from California to British Columbia.

The distinguishing feature of this species is the almost unicolorous aspect of the under side of secondaries, which are a yellow brown, with occasionally a few lighter spots dimly suggested. The secondaries on the upper side are suffused with yellow-brown in the central area, shading out to a darker brown at the edges.

*Sylvanoides* flies from June to September. It prefers the foothills and mountains.

Early Stages. Unknown.

Illustrated. Plate 61. ♂ fig. 7; ♂ under side fig. 8; ♀ fig. 9.

THE FOREST SKIPPER *(Ochlodes nemorum* Bdv.) resembles the previous species superficially, but may be distinguished by its somewhat darker aspect, and the restriction of the yellow-brown spot on the upper side of secondaries to a narrow area. The under side of secondaries may be a plain yellow, but is frequently heavily mottled.

The range of *nemorum* in California is approximately the same as that of *sylvanoides.* The two may be merely forms of a single variable species.

Early Stages. Unknown.

Illustrated. Plate 61. ♂ fig. 10; ♀ fig. 11; ♂ under side fig. 12.

THE MEADOW SKIPPER *(Ochlodes nemorum pratincola* Bdv.) may be merely an aberration of *nemorum.* It is an exceedingly pale form, as will be noted by reference to the colored figure. The latter is reproduced from Dr. Oberthur's illustration of the type. The left half of the figure represents the under side.

*Pratincola* is at present known only from the type.

Illustrated. Plate 61. ♂ fig. 13.

THE RURAL SKIPPER *(Ochlodes agricola* Bdv.) closely resembles *nemorum,* but is a darker and smaller form.

The distinguishing feature is the presence of a hyaline spot on the primary, lateral to the oblique bar. This does not show in the colored figure, but is invariably present.

*Agricola* occurs throughout the state, flying from May to July.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 61. ♂ fig. 14; ♂ under side fig. 15; ♀ fig. 19.

THE YUMA SKIPPER *(Ochlodes yuma* Edw.) is a large and very lightly marked species, occurring in the deserts from Owen's Valley south to Arizona and east to Utah. It is a great rarity. The figures will serve to differentiate it.

*Yuma* flies in June and July.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 61. ♂ fig. 16; ♂ under side fig. 17; ♀ fig. 18.

### Genus POLITES Scud.

THE SONORA SKIPPER *(Polites sonora* Scud.) may be distinguished from its near relatives by the arrangement of the yellow-brown spots and bars on the under side of secondaries, superimposed on a dark brown ground color. The primaries are more rounded on their outer edges than in the members of the genus *Ochlodes.*

*Sonora* is a common species in the mountains of Washington, Oregon and California, but is seldom taken south of Kern County.

It flies from May to August.

EARLY STAGES. Unknown.

ILLUSTRATED. Plate 61. ♂ fig. 20; ♀ fig. 21; ♂ under side fig. 22.

THE MARDON SKIPPER *(Polites mardon* Edw.) is one of the rarest American skippers. It has been recorded from Washington and Oregon, and may not occur in California, but is included in the hope that stray specimens may later be captured in the northern counties.

The unicolorous upper surfaces of the secondaries are the special characteristic of this species. Nothing is known of its habits or life history.

Illustrated. Plate 61. ♂ fig. 23.

THE SANDHILL SKIPPER *(Polites sabuleti* Bdv.) is taken throughout California, being especially common in the southern coastal plains. The peculiar speckled and barred appearance of the under side of secondaries is a distinguishing feature of this butterfly.

It flies from April to September.

Early Stages. Nothing is known of these save that the larvæ feed on *Carex filifolia* and *Trifolium monanthum.* Possibly other sedges and clovers may serve as food-plants.

Illustrated. Plate 61. ♂ fig. 24; ♀ fig. 25; ♂ under side fig. 26.

THE TECUMSEH SKIPPER *(Polites sabuleti tecumseh* Grin.) is a diminutive alpine race of the previous species, which occurs at high elevations in the Sierras. The colored figures serve adequately to differentiate it.

This is one of the common butterflies in the upper Tuolumne Meadows, above Yosemite.

*Tecumseh* flies in late July and early August.

Illustrated. Plate 61. ♂ fig. 27; ♀ fig. 28; ♂ under side fig. 30; ♀ under side fig. 31.

THE DESERT SANDHILL SKIPPER *(Polites sabuleti comstocki* Gunder) is a desert race of *sabuleti.* In this form the spots and light yellow streaks on the under side of secondaries are so faint as to give the appearance of a clear yellow surface.

Illustrated. Plate 61. ♂ under side fig. 29.

## Genus ATALOPETES Scud.

THE FIELD SKIPPER *(Atalopetes campestris* Bdv.) may be easily distinguished by the presence of a large black spot near the cell of the primaries in the male. The secondaries on the under side are heavily mottled with yellow-brown, on a dark gray-brown field.

The species is abundant in southern California and ranges northward to the San Francisco Bay district. Eastward, its territory extends to the Atlantic Coast.

*Campestris* is probably multiple brooded as it is taken from March to December.

EARLY STAGES. Scudder has recorded these for *A. huron,* (which is listed as a synonym of *campestris)* in the "Butterflies of New England."

Larval food-plant. Grasses.

ILLUSTRATED. Plate 62. ♂ fig. 1; ♀ fig. 2; ♂ under side fig. 3.

## Genus ATRYTONE Scud.

THE DUN SKIPPER *(Atrytone vestris* Bdv.) may occasionally be taken in California. It is a common species in other portions of the United States, particularly east of the Rockies, and in southern Canada. The immaculate fuscous coloration of both surfaces in the male, will serve at once to distinguish it. The female has some faint traces of translucent apical spots near the costa and two minute points on either side of the second median nervule near its origin.

EARLY STAGES. Partially described in Scudder's "Butterflies of New England."

Larval food-plant. Grasses.

ILLUSTRATED. Plate 62. ♂ fig. 4.

## Genus POANES Scud.

THE TAXILES SKIPPER *(Poanes taxiles* Edw.) is doubtfully accredited to California. Its territory extends from Nevada through Arizona and New Mexico to Colorado. The colored figures will serve to identify it.

In southern Arizona it flies in June and July and is apparently common.

Early Stages. Unknown.

Illustrated. Plate 62. ♂ fig. 10; ♀ fig. 11; ♂ under side fig. 5.

THE UMBER SKIPPER *(Poanes melane* Edw.) is one of the common Hesperids of southern California, where it flies from April to June, and again in the fall months. Its range extends north to the San Francisco area. *Melane* frequents wooded areas of the lowlands and foothills.

Early Stages. Unknown.

Illustrated. Plate 62. ♂ fig. 9; ♀ fig. 8; ♂ under side fig. 6.

## Genus AMBLYSCIRTES Scud.

THE ROADSIDE SKIPPER *(Amblyscirtes vialis* Edw.) reaches California only in the northeastern counties, where it is rare. The home of *vialis* is in the far east, but its range extends into the southwest as far as Texas and Nevada.

The colored figures will serve to differentiate it, the checkered fringes and well rounded wings being a special characteristic.

Early Stages. Described in detail by Scudder in "Butterflies of New England."

Illustrated. Plate 62. ♂ fig. 12; ♀ fig. 13.

THE PHYLACE SKIPPER *(Amblyscirtes phylace* Edw.) does not, in all probability, occur in California, but its Arizona habitat may possibly supply an occasional straggler across the border.

In this species, the fringes are whitish, a feature that is not clearly brought out in the colored figure. The wings are a solid fuscous-black.

It may some day be recorded in the territory adjacent to the Colorado River, and collectors are urged to look for it in this district.

Early Stages. Unknown.

Illustrated. Plate 62. ♂ fig. 17; ♂ under side fig. 22.

## Genus LERODEA Scud.

THE EUFALA SKIPPER *(Lerodea eufala* Edw.) occurs commonly in the Coachella and Imperial Valleys, and has also been taken in the San Diego district. It ranges eastward to the Gulf states. In the southern deserts it is double or triple brooded.

In this species the spots are white and the under surfaces of the secondaries a uniform gray. This will serve to distinguish it from *Prenes errans,* with which it is sometimes confused.

Early Stages. Minutely described by Karl Coolidge in the "Entomological News," Vol. 33, p. 305.

Egg. Hemispherical, the surface broken by a delicate tracery of scarcely perceptible polygonal cells. Color, delicate pale green.

Caterpillar. When mature, vivid grass-green, covered with black papillæ bearing hairs. There is a dorsal dark green line bordered with a blotching of yellow, and two supra-stigmatal stripes of the same color. A white substigmatal line also occurs. Segmental creases, bright yellow.

Chrysalis. Slender and cylindrical. Color, green, with a prominent dark green dorsal line on abdomen having a yellowish edging. A subdorsal whitish band is present.

Larval food-plant. Grasses.

Illustrated. Plate 62. ♂ fig. 14; ♀ fig. 15; ♂ under side fig. 16.

## Genus CALPODES Hbn.

THE BRAZILIAN SKIPPER *(Calpodes ethlius* Cram.) has been recorded for southern California, but is evidently not an established resident. It may have secured a temporary foothold, as a result of being shipped into the state on nursery stock.

The normal range of *ethlius* is from Florida to Texas, and south to Argentina, but occasional examples are taken in regions far from its accustomed home. Thus it is on record from New York, and St. Louis, Missouri, both of which districts are remote from its native heath.

Early Stages. Egg. Undescribed.

Caterpillar. Green, with lilac-brown across the dorsum, and two punctate spots at the side of the frontal vesicle. The larva rolls the food-plant into a funnel-shaped tube, in which it remains concealed.

Chrysalis. Green, with a spine-like curved appendage on the frons. The tongue case projects beyond the apex of the abdomen.

Larval food-plant. Canna.

Illustrated. Plate 62. ♂ fig. 24; ♂ under side fig. 20.

## Genus PRENES Scud.

THE WANDERING SKIPPER *(Prenes errans* Skin.) occurs in a narrow strip of territory along the ocean front, from San Diego north to Santa Barbara or San Luis Obispo Counties. It is common in the southern part of this range, but becomes quite rare in its northern limits.

In this species the spots are a cream-yellow, and the secondaries are somewhat protruded at the anal angle. These features will help to distinguish it from *Lerodea eufala.* It flies in September.

Early Stages. The larva is briefly described in Seitz "Macrolepidoptera of the World" where it is recorded as "green, the head marked black, with green feet." Of the other stages, nothing is known.

Illustrated. Plate 62. ♂ fig. 18; ♂ under side fig. 19; ♀ fig. 21.

## Family Megathymidae

IN THIS group of insects there are a number of structural peculiarities which are so distinctive as to warrant special consideration. Some writers have placed them in close relation to the *Castniidae,* a genus of day-flying moths. It has also been frequently suggested that they represent a connecting link between the butterflies and moths.

The life history of the various species, so far as known, is peculiar in the fact that the larvæ are borers, and tunnel in the pith of yucca.

The family is confined to the southern portion of the United States, and northern Mexico.

The butterflies are large bodied, and are extremely rapid flyers, but their habit of gathering in moist places is a saving grace from the collectors viewpoint.

### THE YUCCA BORERS. Genus MEGATHYMUS Scud.

STEPHEN'S SKIPPER *(Megathymus stephensi* Skin.) is one of the rarest California butterflies. It has been taken in the desert portions of San Diego County, and probably occurs in the Imperial Valley, and the arid lands adjacent to the Colorado River. It is on the wing from July to October.

The species is closely related to *M. neumoegeni,* and may be only a race of that insect. *Neumoegeni* is not illustrated, but may be distinguished from *stephensi* by the rounder white spots of the latter species, and the further fact that in *neumoegeni* these spots are separated by dark lines or broad dark areas.

Early Stages. Unknown.

Illustrated. Plate 62. ♂ fig. 23.

THE NAVAJO SKIPPER *(Megathymus yuccæ navajo* Skin.) is another rare member of this interesting group which has been taken in the deserts of southern California. Captures are reported from March to June. It is a race of *yuccæ* in which the spots of the primaries are usually white instead of yellow, as in the parent form. The broad white margins of the secondaries are also a differentiating feature.

EARLY STAGES. These have not been determined for the race *navajo*, but are probably quite similar to those of the parent species, *yuccæ*. The metamorphosis of the latter is illustrated in Holland's "Butterfly Book," and a detailed description is given by Riley in the "Eighth Report of the State Entomologist of Missouri."

—Photo Courtesy Geo. F. Clifton

YUCCA IN BLOOM

# SYNONYMIC LIST OF THE BUTTERFLIES OF CALIFORNIA

Synonyms are written in *Italics*
‡Indicates an unavailable name, usually a homonym.

## Superfamily **PAPILIONOIDEA**

### PAPILIONIDÆ

Papilio L.

1 philenor *L.*
*astinous* Dru.
*a* hirsuta *Skin.*

2 polydamas *L.**

3 bairdii *Edw.*
*utahensis* Stkr.
*form* oregonia *Edw.*
*form* brucei *Edw.*
*form* hollandii *Edw.*

4 zelicaon *Luc.*
*zolicaon* Bdv.
*californica* Men.
*coloro* Wright

5 indra *Reak.*
*a* pergamus *Hy. Edw.*

6 rutulus *Luc.*
*a* ammoni *Behrens*

7 multicaudata *Kirby*
‡*daunus* Bdv. nec Cram.

8 eurymedon *Luc.*
*lewisii* Kirby
*form* albanus *F. & F.*
*ab.* cocklei *Gunder*

Parnassius Latr.

9 clodius *Men.*
*castus* Bryk
*a* claudianus *Stich.**
*pseudogallatinus* Bryk
*ab.* altaurus *Dyar*
*b* baldur *Edw.*
*lusca* Stich.
*ab.* lorquini *Oberth.*
*ab.* binigrimaculella *Gunder*

10 smintheus *Dbldy. & Hew.*†
*a* magnus *Wright*
*pseudocorybas* Verity
*minor* Stich.
*xanthus* Ehr.
*b* behrii *Edw.*
*astriotes* Fruhs.
*ab.* niger *Wright*

### PIERIDÆ (ASCIIDAE)

Neophasia Behr

11 menapia *F. & F.*
*tau* Scud.
*ninonia* Bdv.
♀ *suffusa* Stretch
*ab.* nigracosta *Comst.*

Pieris Schrank.

12 beckerii *Edw.*

13 sisymbrii *Bdv.*
*ab.* ♀ flava *Edw.*
*flavitincta* Comst.

---

*Doubtfully Californian.
†The typical insect does not occur in California.

14 protodice *Bdv. & Lec.*
*gen. vern* vernalis *Edw.*
*a* occidentalis *Reak.*
*b* calyce *Edw.*

15 napi *L.*†
*arctica* Verity
*a gen. vern.* oleracea *Harr.*
*hyemalis* Edw.
*gen. æst.* cruciferarum *Bdv.*
*casta* Kirby
*æstiva* Edw.
*b gen. vern.* venosa *Scud.*
*nasturtii* Bdv.
*ab.* ♀ flava *Edw.*
*gen. æst.* castoria *Reak.*
*iberidis* Bdv.
*ab.* resedæ *Bdv.*
*flava* Edw.
*ab.* cottlei *Gunder*
*c gen. vern.* marginalis *Scud.*
*gen. æst.* pallida *Scud.*
*d.* microstriata *Comst.*

16 rapæ *L.*
*metra* Steph.
*immaculata* Fologne
‡*immaculata* Ckll. nec Fologne
‡*immaculata* Skin. & Aar. nec Fologne, Ckll.
*gen. æst.* yreka *Reak.*
*æstivus* Verity

### NATHALIS Bdv.

17 iole *Bdv.*
*irene* Fitch
*luteolus* Reak.

### EUCHLOE Hbn.

18 creusa *Dbldy. & Hew.*
*elsa* Beut.
*pumilio* Strd.
*a* hyantis *Edw.*
*pseudoausonides* Verity
*b* lotta *Beut.*
*belioides* Verity

19 ausonides *Bdv.*
*ab.* semiflava *Comst.*
*ab.* flavidalis *Comst.*
*a* coloradensis *Hy. Edw.*
*montana* Verity

### ANTHOCHARIS Bdv.

20 lanceolata *Bdv.*
*edwardsii* Behr
*a* australis *Grin.*

21 cethura *F. & F.*
*cooperii* Behr
*angelina* Bdv.
*a* morrisoni *Edw.*
*b* deserti *Wright*

22 pima *Edw.*
*a* caliente *Wright*

---

†The typical insect does not occur in California.

23 sara *Bdv.*
*mollis* Wright
*gen. vern.* reakirtii *Edw.*
*flora* Wright
*ab.* wrighti *Comst.*
*ab.* sternitzkyi *Gunder*
*a* julia *Edw.*
*thoosa* Scud.
*b* stella *Edw.*

### Catopsilia Hbn.

24 sennæ *L.*
*form* ♀ pallida *Ckll.*

### Zerene Hbn.

25 eurydice *Bdv.*
♂ *wosnesenskii* Men.
♀ *lorquini* Bdv.
♀ *helena* Reak.
*ab.* fanniæ *Gunder*
*form* ♀ amorphæ *Hy. Edw.*
*a* bernardino *Edw.*
*ab.* newcombi *Gunder*

26 cæsonia *Stoll*
‡*caroliniana* Petiver pre-L.
*gen. auctum.* rosa M'Neill

### Eurymus Swains.

27 eurytheme *Bdv.*
*ariadne* Edw.
*keewaydin* Edw.
*intermedia* Ckll.
*ab.* ♀ alba *Stkr.*
*form* amphidusa *Bdv.*
*californiana* Men.
*ab.* flava *Stkr.*
*unicitrina* Gunder
*ab.* ♀ alba *Stkr.*
*pallida* Ckll.
*form* eriphyle *Edw.*
*hagenii* Edw.
*gen. vern.* autumnalis *Ckll.*

28 occidentalis *Scud.**
*a* chrysomelas *Hy. Edw.*
*form* ♀ shastæ *B. & Benj.*
*b* barbara *Hy. Edw.*

29 harfordii *Hy. Edw.*
*ab.* weaveræ *Gunder*

30 alexandra *Edw.**
*a* edwardsii *Edw.*
*form* ♀ hatui *B. & Benj.*

31 behrii *Edw.*
*form* ♀ canescens *Comst.*

### Eurema Hbn.

32 mexicana *Bdv.*
♀ *damaris* F. & F.
*depuiseti* Bdv.

33 nicippe *Cram.*

34 lisa *Bdv. & Lec.*†
*euterpe* Men.

35 demoditas *Hbn.*†
‡*delia* Cram. nec D. & S.
*daira* Godt.

---

*The typical insect does not occur in California.
†Doubtfully Californian.

## DANAIDÆ

DANAUS L.

36 menippe *Hbn.*
‡*plexippus* Auct. L. partim.
‡*archippus* Fabr. nec Cram.
?*megalippe* Hbn.
*pulchra* Stkr.
*ab.* fumosus *Hlst.*

37 berenice *Cram.*
*a* strigosa *Bates*
*ab.* kerri *Comst.*

## SATYRIDÆ

COENONYMPHA Hbn.

38 california *West. & Hew.*
*ceres* Butl.
*form* galactinus *Bdv.*
*ab.* pulla *Hy. Edw.*

*a* eryngii *Hy. Edw.*
*gen. vern.* siskiyouensis *Comst.*

39 ampelos *Edw.*

*a* elko *Edw.*

NEOMINOIS Scud.

40 ridingsii *Edw.*
*stretchii* Edw.

CERCYONIS Scud.

41 alope *Fabr.**

*a* boopis *Behr*
*ariane* Bdv. partim.
*form* baroni *Edw.*
*form* incana *Edw.*

42 ariane *Bdv.* partim.
*gabbii* Edw.
*form* ♀ stephensi *Wright*

*a* wheeleri *Edw.*
*hoffmani* Stkr.

43 behrii *Grinnell*

44 sthenele *Bdv.*

45 silvestris *Edw.*
*okius* Oberth.

*a* paulus *Edw.*

46 oetus *Bdv.*
*charon* Edw.

OENEIS Hbn.

47 nevadensis *F. & F.*
*gigas* Butl.
*californica* Bdv.
*form* iduna *Edw.*

48 ivallda *Mead*

---

*The typical insect does not occur in California.

## NYMPHALIDÆ

### HELICONIINÆ

Dione Hbn.

- 49 vanillæ *L.**
  - *passifloræ* Fabr.
  - *a* comstocki *Gunder*
    - *form norm* incarnata *Riley*

### NYMPHALINÆ

Euptoieta Dbldy.

- 50 claudia *Cram.*
  - *daunius* Hbst.
- 51 hegesia *Cram.*†

Argynnis Hbn.
(Dryas Hbn.)

- 52 apacheana *Skin.*
  - *ab.* hermosa *Comst.*
- 53 leto *Behr*
  - *ab.* letis *Wright*
- 54 chitone *Edw.*
- 55 bremnerii *Edw.**
  - *a* hippolyta *Edw.*
- 56 cottlei *Comst.*
- 57 behrensii *Edw.*
- 58 zerene *Bdv.*
  - *monticola* Behr
  - *form* conchyliatus *Comst.*
  - *ab.* shastaensis *Comst.*
- 59 hydaspe *Bdv.*
  - *ab.* caliginosa *Comst.*
  - *a* purpurascens *Hy. Edw.*
  - *b* viridicornis *Comst.*
- 60 irene *Bdv.*
- 61 nevadensis *Edw.*
- 62 snyderi *Skin.*
  - *a* californica *Skin.*
  - *b* gunderi *Comst.*
- 63 adiaste *Behr*
  - *adiante* Bdv.
  - *a* clemencei *Comst.*
  - *b* atossa *Edw.*
    - *form* tejonica *Comst.*
- 64 semiramis *Edw.*
- 65 callippe *Bdv.*
  - *comstocki* Gunder
- 66 coronis *Behr*
  - *liliana* Hy. Edw.
  - *ab.* baroni *Edw.*
- 67 rupestris *Behr*
- 68 juba *Bdv.*
  - *laura* Edw.
  - *a* inornata *Edw.*
- 69 macaria *Edw.*
  - *a* laurina *Wright*
- 70 montivaga *Behr*
  - *egleis* Bdv.
  - *ab.* mammothi *Gunder*
  - *a* malcolmi *Comst.*
  - *b* tehachapina *Comst.*
  - *c* oweni *Edw.*
- 71 mormonia *Bdv.*
  - *arge* Stkr.
  - *a* erinna *Edw.*

---

*The typical insect does not occur in California.
†Doubtfully Californian.

BRENTHIS Hbn.

72 epithore *Edw.*
  *ab.* eldorado *Strd.*
  *ab.* wawonæ *Gunder*
  *ab.* obscuripennis *Gunder*

EUPHYDRYAS Scud.

73 chalcedona *Dbldy.&Hew.*
  *cooperi* Behr
  *ab.* fusimacula *Barnes*
  *grundeli* Cool.
  *ab.* lorquini *Oberth.*
  *suprafusa* Comst.
  *ab.* supranigrella *Comst.*
  *ab.* fusisecunda *Comst.*
  *ab.* hemimelanica *Comst.*
  *ab.* mariana *Barnes*
  *ab.* omniluteofuscus *Gunder*
  *ab.* hemiluteofuscus *Gunder*
 *a* dwinellei *Hy. Edw.*
 *b* macglashanii *Rivers*
 *c* olancha *Wright*

74 colon *Edw.*
  *ab.* huellemanni *Comst.*
  *ab.* nigrisupernipennis *Gunder*

75 baroni *Edw.*
  *edithana* Strd.
  *ab.* mirabilis *Wright*

76 quino *Behr*
 *a* augusta *Edw.*
  *ab.* augustina *Wright*

77 rubicunda *Hy. Edw.*
  *ab.* rubrosuffusa *Comst.*
  *ab.* foxi *Gunder*
  *ab.* albiradiata *Gunder*

78 nubigena *Behr*

79 editha *Bdv.*
  *ab.* fieldi *Gunder*

80 sierra *Wright*
  *ab.* magdalenæ *Gunder*
  *ab.* umbrobasana *Gunder*

81 wheeleri *Hy. Edw.*

MELITAEA Fabr.
(Lemonias Hbn.)

82 neumoegeni *Skin.*

83 gabbii *Behr*
  *sonoræ* Bdv.
  *ab.* newcombi *Comst.*
  *ab.* gunderi *Comst.*
  *ab.* pasadenæ *Gunder*

84 malcolmi *Comst.*

85 acastus *Edw.*
*ab.* pearlæ *Gunder*

86 palla *Bdv.*
*calydon* Mead
*ab.* wardi *Oberth.*
*ab.* blackmorei *Gunder*
*form* ♀ eremita *Wright*
*ab.* stygiana *Comst.*
*a* whitneyi *Behr*

87 hoffmanni *Behr*
*helcita* Bdv.
*ab.* abnorma *Wright*
*a* segregata *B. & McD.*
*bridgei* Comst.

88 chara *Edw.*
*ab.* jacintoi *Gunder*
*ab.* nitela *Comst.*

89 leanira *F. & F.*
*form* leona *Wright*
*form* obsoleta *Hy. Edw.*
‡*obliterata* Stkr. lapsus calami

90 wrightii *Edw.*
*ab.* cerrita *Wright*
*ab.* carolynæ *Gunder*

91 alma *Stkr.*

92 pola *Bdv.*†
*a* monache *Comst.*

Phyciodes Hbn.

93 phaon *Edw.*
*æstiva* Edw.

94 campestris *Behr*
♂ *pratensis* Behr

95 montana *Behr*
*orsa* Bdv.

96 orseis *Edw.*

97 mylitta *Edw.*
*collina* Behr
*epula* Bdv.

Chlosyne Butl.

98 lacinia *Gey.**
*a* adjutrix *Scud.*
*nigra* Ckll. partim
*bicolor* Ckll. partim.
*rufa* Ckll. partim.
*b* rufescens *Edw.*
*c* crocale *Edw.*
*nigra* Ckll. partim.
*bicolor* Ckll. partim.
*rufa* Ckll. partim.
*d* nigrescens *Ckll.*

99 californica *Wright*
*ab.* chinoi *Gunder*

Polygonia Hbn.

100 satyrus *Edw.*
*form* chrysoptera *Wright*
*a* marsyas *Edw.*

---

†The typical insect is doubtfully Californian.
*Doubtfully Californian.

101 faunus *Edw.**
*virescens* Scud.
*a* rusticus *Edw.*
♀ *silvius* Edw.
102 hylas *Edw.*
103 zephyrus *Edw.*
*thiodamas* Scud.
104 silvius *Edw.*
105 oreas *Edw.**
*a* silenus *Edw.*

AGLAIS Dal.
(Hamadryas Hbn.)
106 californica *Bdv.*
107 milberti *Godt.*
*furcillata* Say
*form* subpallida *Ckll.*
108 antiopa *L.*
*pompadour* Poll.
*ab.* grandis *Ehr.*
*ab.* obscura *Ckll.*†
*ab.* hippolyta *Lym.*†
*ab.* hygiæa *Heydenr.*
*lintnerii* Fitch

VANESSA Fabr.
(Pyrameis Dbldy. Cynthia Fabr.)
109 atalanta *L.*
*admiralis* Retz
*ab.* edwardsi *Grin.*
110 virginiensis *Dru.*
‡*belledonna* Petiver pre-L.
*huntera* Fabr.
*iole* Cram.
*hunteri* Hbn.
*ab.* fulvia *Dodge*
*ab.* ahwashtee *C. L. Fox*
*ab.* massachusettensis *Gunder*
111 cardui *L.*
‡*belledonna* Petiver pre-L.
*carduelis* Seba
*ab.* minor *Ckll.*†
*ab.* elymi *Ramb.*
*ab.* ate *Stkr.*†
112 carye *Hbn.*
*charie* Blanch.
*ab.* intermedia *Grin.*
*ab.* muelleri *Letch.*
*ab.* letcheri *Grin.*

JUNONIA Hbn.
113 cœna *Hbn.*
*ab.* schraderi *Gunder*
*a* nigrosuffusa *B. & McD.*

BASILARCHIA Scud.
114 weidemeyrii *Edw.**
*a* nevadæ *B. & Benj.*
115 lorquini *Bdv.*
*ab.* eavesii *Hy. Edw.*
*ab.* comstocki *Gunder*
*a* burrisonii *Mayn.*
116 obsoleta *Edw.*
*hulstii* Edw.

HETEROCHROA Bdv.
117 bredowii *Gey.**
*a* californica *Butl.*

---

*The typical insect does not occur in California.
†No California records.

## LIBYTHEIDÆ

Libythea Fabr.

118 bachmanii *Kirt.*
*motya* Bdv. & Lec. partim.
*form* larvata *Stkr.*

## RIODINIDÆ

Apodemia F. & F.

119 mormo *F. & F.*
*dumeti* Behr
*mormonia* Bdv.
*a* virgulti *Behr*
*sonorensis* F. & F.
*cythera* Edw.
*b* mejicanus *Behr*†
*duryi* Edw.
*c* deserti *B. & McD.*

120 palmerii *Edw.**
*form* marginalis *Skin.*

Calephelis G. & R.
(Lephelisca B. & L.)

121 nemesis *Edw.*
*a* australis *Edw.*

## LYCÆNIDÆ

### THECLINÆ

Habrodais Scud.
122 grunus *Bdv.*

Atlides Hbn.
123 halesus *Cram.*
*dolichos* Hbn.
*juanita* Scud.

Hypaurotis Scud.
124 chrysalus *Edw.*

Strymon Hbn.
125 columella *Fabr.*
*eurytulus* Hbn.
*istapa* Reak.
*salona* Hew.
*modesta* Mayn.
*ocellifera* Grt.

126 leda *Edw.*
*a* ines *Edw.*

127 avalona *Wright*

128 melinus *Hbn.*
*hyperici* Bdv. & Lec.
*humuli* Harr.

129 titus *Fabr.**
*mopsus* Hbn.
*a* immaculosus *Comst.*

130 californica *Edw.*
*borus* Bdv.
*cygnus* Edw.

131 sylvinus *Bdv.*
*a* desertorum *Grin.*

---

*The typical insect does not occur in California.
†Doubtfully Californian.

- 132 dryope *Edw.*
- 133 auretorum *Bdv.*
  - *tetra* Edw.
  - *tacita* Hy. Edw.
  - *a* spadix *Hy. Edw.*
- 134 adenostomatis *Hy. Edw.*
- 135 sæpium *Bdv.*
  - *form* fulvescens *Hy. Edw.*
  - *form* chlorophora *Wats. & W. P. Comst.*
- 136 chalcis *Edw.*

Mitoura Scud.

- 137 spinetorum *Hew.*
  - *ninus* Edw.
  - *cuyamaca* Wright
- 138 johnsoni *Skin.*†
- 139 nelsoni *Bdv.*
  - *ab.* exoleta *Hy. Edw.*
  - *a* muiri *Hy. Edw.*
- 140 siva *Edw.**
  - *rhodope* G. & S.
  - *a* juniperaria *Comst.*
- 141 loki *Skin.*

Incisalia Scud.

- 142 iroides *Bdv.*
- 143 eryphon *Bdv.*

Callophrys Billb.

- 144 dumetorum *Bdv.*
  - *viridis* Edw.
  - *a* perplexa *B. & Benj.*

Callipsyche Scud.

- 145 behrii *Edw.*
  - *kali* Stkr.
  - *ab.* nigroinita *Gunder*

Satyrium Scud.

- 146 fuliginosa *Edw.*
  - *suasa* Bdv.

## CHRYSOPHANINÆ

Tharsalea Scud.

- 147 arota *Bdv.*
  - *a* nubila *Comst.*
- 148 virginiensis *Edw.*
- 149 hermes *Edw.*
  - *del-sud* Wright

Heodes Dalman

- 150 gorgon *Bdv.*
- 151 xanthoides *Bdv.*
  - *form* luctuosa *Wats. & W. P. Comst.*
- 152 editha *Mead*
- 153 mariposa *Reak.*
  - *zeroe* Bdv.
- 154 nivalis *Bdv.*
  - *ianthe* Edw.
- 155 helloides *Bdv.*
  - *castro* Reak.
- 156 cupreus *Edw.*
  - *ab.* maculinita *Gunder*
- 157 rubidus *Behr*
- 158 heteronea *Bdv.*
  - *a* clara *Hy. Edw.*

---

†Doubtfully Californian.

*The typical insect does not occur in California.

## LYCAENINÆ

LEPTOTES Scud.
- 159 marina *Reak.*
  - *ab.* violacea *Gunder*

BREPHIDIUM Scud.
- 160 exilis *Bdv.*
  - *fea* Edw.
  - *ab.* coolidgei *Gunder*

HEMIARGUS Hbn.
- 161 gyas *Edw.*
  - *astragala* Wright
  - *florencia* Clemence
- 162 isola *Reak.*
  - *zachæina* Butl. & Druce (♀; partim.)
  - *alce* Edw.

EVERES Hbn.
- 163 comyntas *Godt.*
  - *sissona* Wright
- 164 amyntula *Bdv.*

PLEBEJUS L.
- 165 melissa *Edw.*
  - *a* lotis *Lint.*
- 166 anna *Edw.*
  - *cajona* Reak.
  - *argyrotoxus* Behr
  - *philemon* Bdv.
- 167 aquilo *Bdv.**
  - *a* podarce *F. & F.*
    - *tehama* Reak.
    - *cilla* Behr
    - *nestos* Bdv.
- 168 sæpiolus *Bdv.*
  - *form* rufescens *Bdv.*
  - *form alt.* æhaja *Behr*
  - *a* hilda *Grin.*
- 169 icarioides *Bdv.*
  - *phileros* Bdv.
  - *fulla* Edw.
  - ?*mintha* Edw.
  - *ab.* dædalus *Behr*
  - *ab.* spinimaculata *Gunder*
  - *a* evius *Bdv.*
- 170 maricopa *Reak.*
  - *pardalis* Behr
  - *erymus* Bdv.
- 171 pheres *Bdv.*
  - *ab.* orcus *Edw.*
- 172 shasta *Edw.*
  - *zelmira* F. & F.
  - *calcas* Behr
  - *nivium* Bdv.
  - *a* comstocki *Fox*
- 173 acmon *West. & Hew.*
  - *antægon* Bdv.
  - *a* cottlei *Grin.*
    - *ab.* labecula *Wats & W. P. Comst.*
  - *b* lupini *Bdv.*
  - *c* monticola *Clemence*
    - *ab.* malcolmi *Gunder*
    - *ab.* pallida *Gunder*
  - *d* chlorina *Skin.*
    - *form* ♂ carolyna *Comst.*
- 174 emigdionis *Grin.*
  - *melimona* Wright
- 175 neurona *Skin.*

---

*The typical insect does not occur in California.

PHILOTES Scud.

176 battoides *Behr*
  *a* oregonensis *B. & Mc.D.*
  *b* bernardino *B. & McD.*
    *ab.* baldyensis *Gunder*

177 glaucon *Edw.*
  *a* intermedia *B. & McD.*
  *b* centralis *B. & McD.*

178 enoptes *Bdv.*

179 rita *B. & McD.*
    *mojave* *Wats.&Comst.*

180 speciosa *Hy. Edw.*

181 sonorensis *F. & F.*
    *regia* Bdv.
    *ab.* sonoralba *Wats & W. P. Comst.*
    *form* comstocki *Gunder*

PHAEDROTES Scud.

182 piasus *Bdv.*
    *sagittigera* F. & F.
    *viaca* Edw.
    ‡*lorquini* Behr nec. H.-S.
  *a* catalina *Reak.*
    *rhœa* Bdv.
    *ab.* gorgonioi *Gunder*

GLAUCOPSYCHE Scud.

183 lygdamus *Dbldy.**
  *a* behrii *Edw.*
  *b* columbia *Skin.*
  *c* australis *Grin.*
    *ab.* sinepunctata *Comst.*

184 xerces *Bdv.*
    *form* mertila *Edw.*
    *ab.* huguenini *Gunder*
    *form ab.* antiacis Bdv.
    *norm* polyphemus *Bdv.*

LYCAENOPSIS F. & F.

185 pseudargiolus *Bdv. & Lec.**
  *a* cinerea *Edw.*
    *gen. æst.* arizonensis *Edw.*
  *b* echo *Edw.*
    *ab.* nunenmacheri *Strd.*

## Superfamily **HESPERIOIDEA**

### HESPERIIDÆ

### URBANINÆ

POLYGONUS Hbn.

186 lividus *Hbn.**
  *a* arizonensis *Skin.*

EPARGYREUS Hbn.

187 tityrus *Fabr.*
    *clarus* Cram.

188 exadeus *Cram.*†

---

*The typical insect does not occur in California.
†Doubtfully Californian.

Goniurus Hbn.
189 proteus *L.*
‡*fortis* Skin.&Ramsd. (lapsus calami)
190 dorantes *Stoll**
*a* rauterbergi *Skin.*†

Thorybes Scud.
191 mexicana *H.-S.*
*ananius* Ploetz
192 nevada *Scud.*
*æmilea* Skin.

Urbanus Hbn.
193 ruralis *Bdv.*
*cæspitalis* Bdv.
*ricaria* Edw.
*petreius* Edw.
194 scriptura *Bdv.*
195 tessellata *Scud.**
*a* occidentalis *Skin.*
196 ericetorum *Bdv.*
*alba* Edw.

Antigonus Hbn.
197 pulverulenta *R. Feld.*
*zampa* Edw.

Pholisora Scud.
198 alpheus *Edw.*
*oricus* Edw.
199 libya *Scud.*
200 catullus *Fabr.*
?*l'herminier* Latr.
?*herminieri* Morris

Erynnis Schr.
201 lacustra *Wright*
‡*callidus* Grin. ("♀" nec ♂; partim.)
202 persius *Scud.*
*a* afranius *Lint.*
*b* pernigra *Grin.*
203 callidus *Grin.* (♂ partim.)
*lilius* Dyar.
204 juvenalis *Fabr.*
*juvenis* Hbn.
*costalis* West &. Hew.
*ennius* Scud. & Burg.
?*plautus* Scud. & Burg.
205 propertius *Scud. & Burg.*
?*tibullus* Scud & Burg.
206 tristis *Bdv.*
207 funeralis *Scud. & Burg.*

## HESPERIINÆ

Pamphilidia Lind.
208 palæmon *Pall.*
*mandan* Edw.
*mesapano* Scud.
*skada* Edw.

Copaeodes Edw.
209 aurantiaca *Hew.*
*waco* Edw.
*procris* Edw. (♂; partim.)
*macra* Ploetz
*candida* Wright

Pseudocopaeodes Skin. & Wms.
210 eunus *Edw.*
*wrightii* Edw.

---

*The typical insect does not occur in California.
†Doubtfully Californian.

Hesperia Fabr.
211 morrisoni *Edw.*†
212 columbia *Scud.*
*california* Wright
*erynnioides* Dyar
213 comma *L.**
*a* idaho *Edw.*
*b* oregonia *Edw.*
214 juba *Scud.*
215 viridis *Edw.*
216 nevada *Scud.*
217 ruricola *Bdv.*

Hylephila Billb.
218 phylæus *Dru.*
*bucephalus* Steph.
♀ *hala* Butl.

Ochlodes Scud.
219 sylvanoides *Bdv.* (♂; partim.)
*pratincola* Bdv. (♀; partim.)
*francisca* Ploetz
220 nemorum *Bdv.*
*verus* Edw.
*a* pratincola *Bdv.* (♂; partim.)
221 agricola *Bdv.*
*yreka* Edw.
*milo* Edw.
222 yuma *Edw.*
*scudderi* Skin.

Polites Scud.
223 sonora *Scud.*
*siris* Edw.
224 mardon *Edw.*†
225 sabuleti *Bdv.*
*genoa* Ploetz
*a* tecumseh *Grin.*
*chispa* Wright
*b* comstocki *Gunder*

Atalopedes Scud.
226 campestris *Bdv.*
*sylvanoides* Bdv. (♀; partim.)
*huron* Edw.

Atrytone Scud.
227 vestris *Bdv.*
*metacomet* Harr.
*rurea* Edw.
*kiowa* Reak.
*osyka* Edw.
*osceola* Lint.

Poanes Scud.
228 taxiles *Edw.*†
229 melane *Edw.*

Amblyscirtes Scud.
230 vialis *Edw.*
231 phylace *Edw.*†

Lerodea Scud.
232 eufala *Edw.*
*floridæ* Mab.
*dispersus* Gundl.

Calpodes Hbn.
233 ethlius *Cram.*
*chemnis* Fabr.
*olynthus* Bdv. & Lec.

Prenes Scud.
234 errans *Skin.*

## MEGATHYMIDÆ

Megathymus Scud.
235 yuccæ *Bdv. & Lec.**
*b* navajo *Skin.*
236 stephensi *Skin.*

---

*The typical insect does not occur in California.
†Doubtfully Californian.

In noting the capture of butterflies throughout the state it is of importance to record the exact location in which a specimen is taken. If the township is unknown, at least the County should be recorded. Data of this kind will make it possible to more accurately record the distribution of the native species. The range of a number of butterflies indigenous to California is, as yet, imperfectly known.

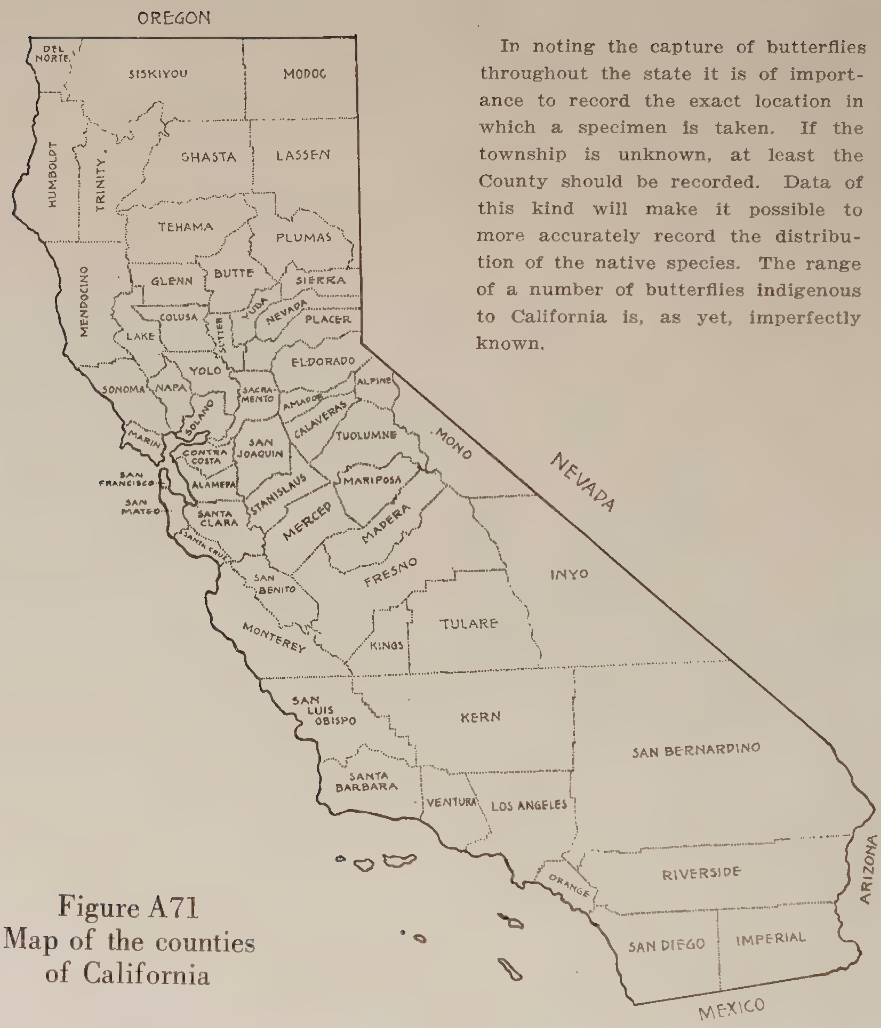

OREGON
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
COLUSA
SUTTER
YUBA
NEVADA
PLACER
LAKE
YOLO
EL DORADO
ALPINE
SONOMA
NAPA
SACRAMENTO
AMADOR
SOLANO
CALAVERAS
TUOLUMNE
MONO
MARIN
CONTRA COSTA
SAN JOAQUIN
NEVADA
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
MADERA
SANTA CRUZ
FRESNO
INYO
SAN BENITO
TULARE
MONTEREY
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
ARIZONA
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL
MEXICO

Figure A71
Map of the counties
of California

# LIFE ZONES OF CALIFORNIA

It is of scientific interest to note the life zones in which species occur. Many insects are limited to a single zone as a result of their dependence on a certain food-plant.

The great diversity of the California insect fauna is partly explained by the number of different life zones, and the characteristic plant associations occurring in each zonal area.

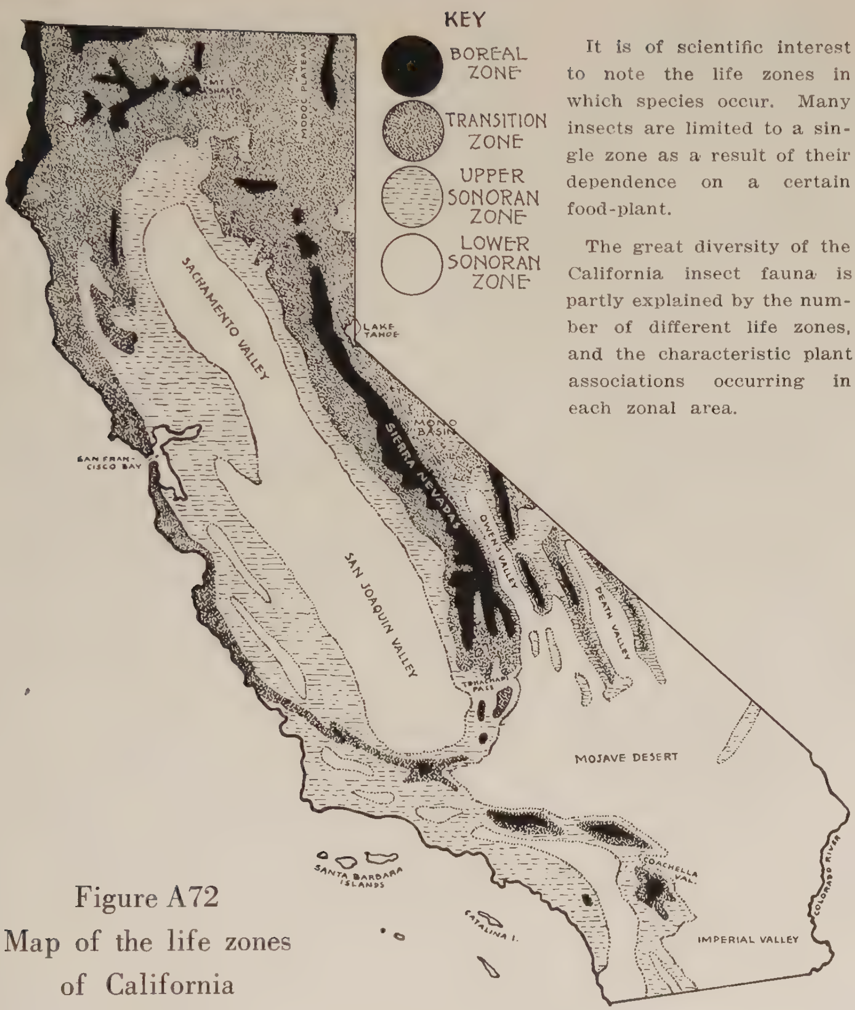

KEY
BOREAL ZONE
TRANSITION ZONE
UPPER SONORAN ZONE
LOWER SONORAN ZONE
MT SHASTA
MODOC PLATEAU
SACRAMENTO VALLEY
LAKE TAHOE
MONO BASIN
SIERRA NEVADAS
SAN FRANCISCO BAY
OWENS VALLEY
DEATH VALLEY
SAN JOAQUIN VALLEY
TEHACHAPI PASS
MOJAVE DESERT
SANTA BARBARA ISLANDS
CATALINA I.
COACHELLA VAL.
COLORADO RIVER
IMPERIAL VALLEY

Figure A72
Map of the life zones of California

# THE CAPTURE, PREPARATION AND PRESERVATION OF SPECIMENS

THE subject of the proper methods of capture, preparation and preservation of butterflies has been so thoroughly treated by W. J. Holland, in the "Butterfly Book," and by various authors in other accessible works, that it seems hardly necessary to treat the matter in detail. Nearly every community now has its Public Library, in which books on insect collecting are obtainable. Most of the large centers have, in addition, excellent Museums, with departments devoted to Entomology. The Curators of these divisions are always pleased to give information, when it is sought in a spirit of earnest desire to learn.

For the sake of those who may not have access to books on entomological collecting methods, brief consideration will be given to the subject.

## COLLECTING PARAPHERNALIA

THE NET. Butterflies are such delicate insects that they require special care in the capture. For this purpose, a net is the first essential.

Many types of collecting nets are on the market, some of which are almost worthless on account of the coarse net material used in the bag.

A simple net may be made of a bamboo rod, a ring of wire, a ferrule, and enough bobbinet to make the bag. The handle of the net should be from four to five feet in length. The ring should be securely fastened and held in place by a ferrule. The opening of the ring should measure twelve to fourteen inches. The bag of the net should be made of a fine grade of soft cotton bobbinet, and not of a harsh material such as mosquito netting. It should be eighteen to twenty inches in length to insure holding an insect, once it is within the bag. Brown or green netting is preferable to white, as the movement of a net of this character is less noticeable to some wary butterflies.

A number of collapsible nets are on the market and are sold by firms dealing in biological supplies. It is a matter of convenience to be able to disjoint the net and pack it into small space.

**The Killing Box.** Many collectors use a glass jar, containing cyanide of potassium imbedded in plaster of paris, for killing insects. This is necessary with most moths, but a more convenient apparatus has been devised for butterflies. It consists of a can measuring about two by three by four inches, with a removable top. An empty cocoa can will serve the purpose. In the bottom is poured a thin layer of plaster of paris; a few lumps of sodium or potassium cyanide are imbedded in this, and the mixture allowed to set. (This chemical is deadly poison and must be handled with great care). After it is dry a sheet of blotting paper is fitted on top of the hardened plaster. The entire filling should measure about one inch in depth. Strips of soft paper are then cut to fit the box, (as shown in Figure A73), and folded back and forth so as to form numerous compartments when in place. A canvas case can be fitted to the box and made with a side loop so that it may be carried on the belt.

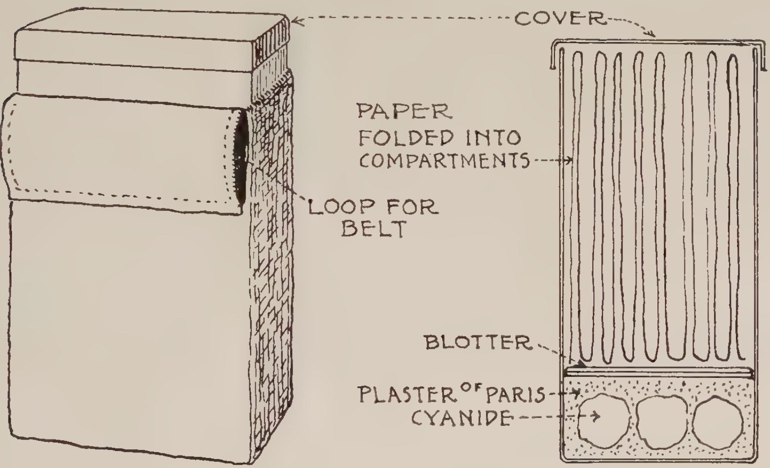


FIGURE A73

A collecting box of this character will hold an entire day's catch of butterflies, and each specimen will be held in place by the paper partitions, thus insuring against damage.

## COLLECTING TECHNIQUE

The art of capturing butterflies can be acquired only by practice. The first essential is dexterity of movement and delicacy of touch. Rubbed or torn butterflies are practically worthless in a collection.

After a specimen has been taken in the net it must be so handled as to preserve intact all of the delicate scales covering the wings. In order to do this the butterfly must not be touched except on the front portion of the body, or thorax. Many insects will beat about in the net and become damaged. To prevent this, the bag is stretched, or so held as to restrict the insect's movements. Some collectors prefer to hold the butterfly in this manner and give a quick pinch on the thorax, temporarily paralyzing the insect. It may then be dropped into the collecting box, where the cyanide fumes will quickly kill it.

If this method is considered cruel, another procedure may be followed. While the insect is held motionless in the net, a drop or two of chloroform is placed on the thorax. This will temporarily suspend the activity of the captive.

## MOUNTING

It is advisable to pin and mount butterflies before they have had time to dry. For this purpose a few special items are necessary.

Pins. The pins used for mounting insects are of a special type manufactured for the purpose and must be secured from dealers in entomological supplies. They are longer and finer and possess a higher degree of temper than the ordinary pin. Many a good specimen has been utterly ruined by the use of the wrong kind of pin.

Setting Blocks. A setting block suitable for mounting butterflies is shown in Figure A74. This has a groove for the reception of a pin and a strip of cork, or other suitable material at the base of the groove.

Forceps. In preparing the butterfly for the block it must be handled with forceps or tweezers, otherwise it is liable to damage.

Spreading. The pin is inserted through the thorax and the butterfly adjusted on the board. The wings may then be brought into position by the use of fine needles and held flat with tracing muslin or paper.

**Drying.** Spread specimens should be allowed to remain on the setting block for a number of days. If removed too soon the wings will droop. While drying they must be placed where they will be secure from mice, ants and other pests. The process may be facilitated by the use of an artificially heated box, but for the average collector this is unnecessary.

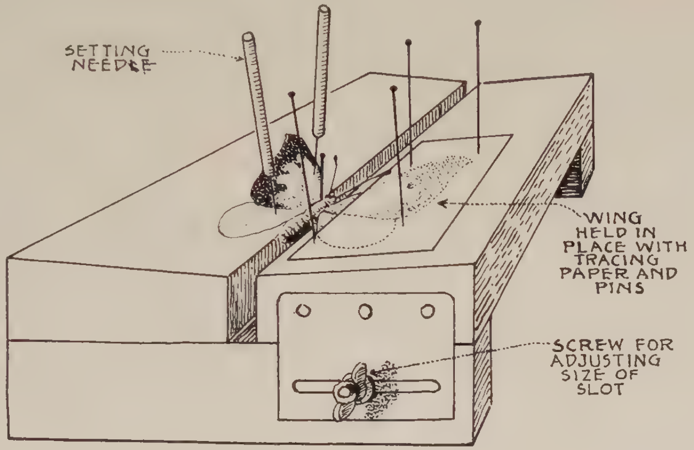
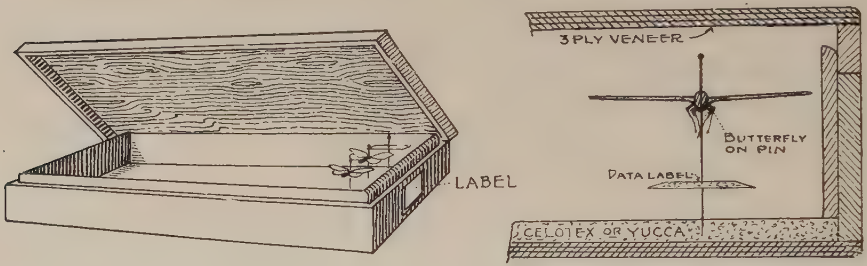

SETTING NEEDLE
WING HELD IN PLACE WITH TRACING PAPER AND PINS
SCREW FOR ADJUSTING SIZE OF SLOT

FIGURE A74

## PRESERVATION AND ARRANGEMENT

**Cabinets.** Butterflies must be kept in boxes and cabinets that will exclude light, moisture and insect pests. Storage boxes and cabinets of many types are manufactured for this purpose, but the student may prefer to make his own. A simple and convenient type is shown in Figure A75.

**Lining.** The floor of this box may be lined with celotex, yucca fiber or cork. Celotex is a porous building material which can be secured in large sheets and sawed to any desired size. In California the dried stalks of the yucca furnish an excellent lining material. These can be cut in thin sheets, the woody outer edges removed and the slabs glued edge to edge. White paper should be pasted over both surfaces of the slabs, which must then be dried under pressure to prevent buckling. Lining made in this manner takes the pin with less resistance than cork and is inexpensive.



SPECIMEN BOX, OPENED.

SECTION THROUGH SPECIMEN BOX.

FIGURE A75

Display Mounts. Butterflies may be mounted for display in cardboard boxes with glass covers, the specimens resting on cotton. An excellent mount is obtainable from supply houses. When specimens are sealed against infestation in this type of container they have the advantage of being easily handled.

Two Riker mounts containing butterflies can be attached to a book cover or folder in such manner as to have the appearance of a bound volume. Figure A76, 3, shows such an arrangement. When the container is closed the glass surfaces are in contact. A shelf of butterflies mounted in this manner gives the appearance of a library. The specimens are protected from light and pests and they may be handled without damage.

Mr. Jean Gunder has devised a modification of this method, which is illustrated in Figure A76, 2.

Another mount has been invented with glass top and bottom, in which the specimens are held by means of small strips of glass and both surfaces may be observed. The Denton Brothers, of Wellesley, Massachusetts, manufacture a mount of this style in several sizes.

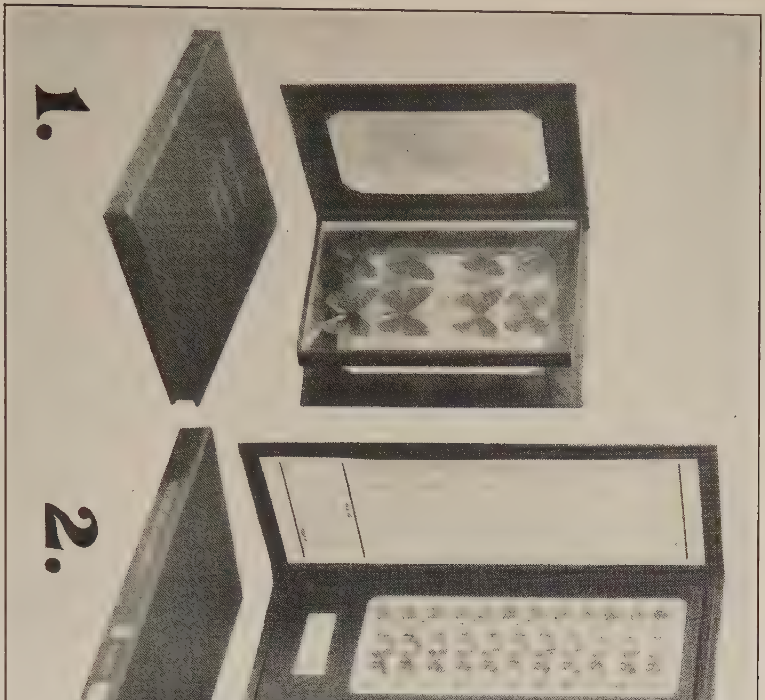


FIGURE A76

Butterfly Collections in Book Style. Courtesy of Jean Gunder.

Mr. R. F. Sternitzky has used a similar principle in combination with a book cover, as shown in Figure A76, 1.

LABELING. Many different methods of labeling a collection are used. The chief essential is to have a small tag under each specimen held by the same pin which holds the butterfly, giving the date, place of capture and collector. The genus should be indicated by a separate label placed at the heading of each generic series, and smaller labels giving the specific name and an abbreviation of the author's name, should go below the row of specimens in each given species.

DEGREASING. Butterflies occasionally become greasy. When this happens they may be cleaned by soaking in an enclosed vessel containing benzine or ether for a number of days. (Both fluids are explosive and must be handled with caution.) When removed from the bath specimens should be dried in a dust free chamber.

PRESERVATIVES. Butterflies are subject to the ravages of a number of insect pests including clothes moths, mites and minute beetles. These will soon reduce a collection to powder if precautionary measures are not used. For the purpose a white crystalline substance known as para dichlorbenzene is recommended. It is sold under various trade names such as paracide and dichloricide. A small amount of this chemical is placed in the bottom of all insect cabinets. It must be renewed about three times during a year.

Flake naphthaline may be used for the same purpose, but is less effective.

FUMIGATING. When collections have become infested, they may be freed of parasites by enclosing them in an air tight box in which a piece of absorbent cotton, saturated with carbon disulphide, has been placed.

Carbon disulphide must be handled with extreme care, however, as its odor is offensive and penetrating, and it is highly explosive.

## STORING, SHIPPING AND EXCHANGING BUTTERFLIES

**Papering.** It is frequently necessary to pack butterflies in more condensed form than is possible with spread specimens, either for shipping or future reference. The method known as papering supplies this need. Triangular envelopes are used as indicated in Figure A77. Butterflies packed in these envelopes may be stored in boxes or shipped through the mails in comparative safety. It is essential, however, that correct data is written on each envelope, indicating the name of the specimen, its place and date of capture and the name of the collector.

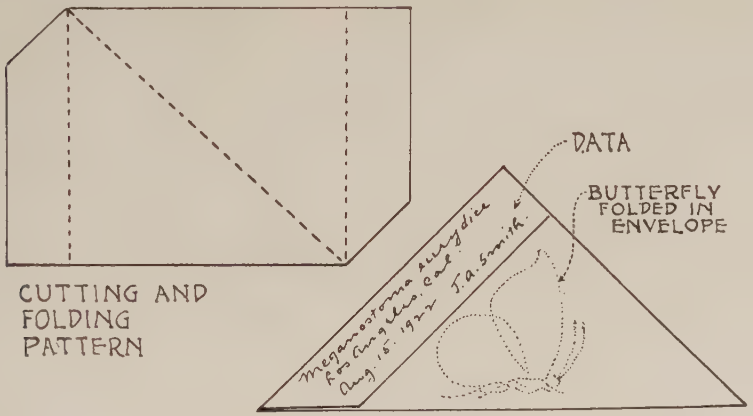

CUTTING AND FOLDING PATTERN
DATA
BUTTERFLY FOLDED IN ENVELOPE
Megarostoma eurydice
Los Angeles. Cal.
Aug. 15. 1922 J.A. Smith.

FIGURE A77

In storing papered specimens it is advisable to use boxes with tightly fitted covers, and to place a small amount of para dichlorbenzene or flake naphthaline in the containers from time to time.

**Relaxing.** Papered specimens require softening before they can be spread. The method used is known as relaxing. There are various ways in which this may be accomplished. A simple method is to moisten a towel or cloth in warm water, in which a few drops of carbolic acid have been mixed to insure against mold. The specimens may be placed in the folds of this dampened cloth without removing them from the envelopes and covered with a sheet of glass to prevent too rapid evaporation.

If the same cloth is used more than once it must be boiled each time, in order to kill the spores of microscopic fungi which otherwise will cause mold.

A relaxing chamber is widely used and is more effective than the previously outlined method. A metal box with well fitted lid, or better still a glass container with cover, is the first requisite. In the bottom of this is fitted a cork, yucca or celotex slab. A small amount of boiling water is poured in, and crystals of para dichlorbenzene and flake naphthaline scattered over the surface. Blotting paper is spread on top of the chemicals. The specimens may then be placed in the chamber and the cover applied. Twenty-four hours should be sufficient for very small butterflies. Experience will demonstrate the time required for softening butterflies of different sizes.

Shipping. Butterflies may be shipped to all parts of the world in comparative safety if a few simple principles are kept in mind. Papered specimens are easier to handle and pack for mailing. They should be placed in cigar boxes with a cotton padding above and below. The filled box must be wrapped and tied, after which it is placed in a corrugated cardboard container of considerably larger size. The excess space must be tightly packed with excelsior.

Exchanging. Collections may be greatly augmented by exchanging duplicate material with other lepidopterists. The names of collectors are secured by consulting directories or the exchange columns of entomological journals. The Naturalists Directory published by S. E. Cassino, of Salem, Massachusetts, contains a list of collectors in the United States arranged by states.

In corresponding for purposes of exchange it is customary to prepare a list of duplicates which are offered, and a similar notation of specimens desired, somewhat as follows:

### Offerta

*Parnassius baldur*
*Neophasia menapia*
*Pieris beckerii*
*Eurymus behrii*
*Coenonympha haydenii*
*Cercyonis paulus*
*Erebia callias*
*Argynnis apacheana*
*Argynnis atossa*
*Argynnis malcolmi*
*Melitaea neumoegeni*
*Militaea wrighti*
*Chlosyne adjutrix*
*Apodemia marginalis*
*Mitoura juniperaria*
*Heodes luctuosa*
*Heodes rubidus*
*Plebejus evius*

### Desiderata

*Papilio nitra*
*Papilio oregonia*
*Parnassius eversmanni*
*Pieris ochsenheimeri*
*Anthocharis morrisoni*
*Eurymus hecla*
*Eurema westwoodi*
*Enodia creola*
*Oeneis norna*
*Oeneis cairnesi*
*Oeneis lucilla*
*Erebia vidleri*
*Argynnis diana*
*Argynnis washingtonia*
*Brenthis montinus*
*Brenthis polaris*
*Strymon jada*
*Strymon critola*

## PUBLICATIONS

JOURNALS. The progressive entomologist will find it necessary to follow the advances made in this department of science. A number of journals are published that will be helpful and informative. A list of the more important ones follows:

The Entomological News,
Academy of Natural Sciences,
Logan Square, Philadelphia, Pennsylvania.

The Canadian Entomologist,
Ottawa, Ontario, Canada.

Psyche,
Cambridge Entomological Club. Bussey Institution,
Forest Hills Boston 30, Massachusetts.

Journal, New York Entomological Society.

American Museum of Natural History,
77th St. and 8th Ave., New York City.

Bulletin, Brooklyn Entomological Society,
11 No. Broadway,
White Plains, N. Y.

Several western journals contain entomological material that is of special value to California students. Three of these are listed:

Bulletin, Southern California Academy of Sciences,
501 Edwards Wildey Building,
Los Angeles, California.

Pan Pacific Entomologist,
Academy of Sciences,
Golden Gate Park, San Francisco, California.

Pomona Journal of Entomology and Zoology,
Pomona College,
Claremont, California.

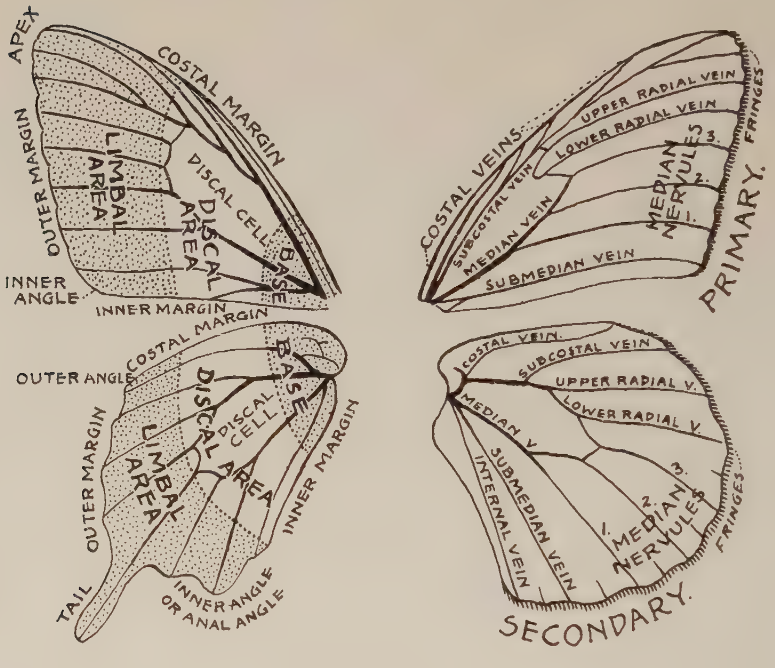

APEX
COSTAL MARGIN
OUTER MARGIN
LIMBAL AREA
DISCAL CELL
DISCAL AREA
BASE
INNER ANGLE
INNER MARGIN
COSTAL MARGIN
OUTER ANGLE
BASE
DISCAL CELL
DISCAL AREA
LIMBAL AREA
OUTER MARGIN
INNER MARGIN
TAIL
INNER ANGLE OR ANAL ANGLE
COSTAL VEINS
SUBCOSTAL VEIN
MEDIAN VEIN
SUBMEDIAN VEIN
UPPER RADIAL VEIN
LOWER RADIAL VEIN
MEDIAN NERVULES
1.
2.
3.
FRINGES
PRIMARY.
COSTAL VEIN.
SUBCOSTAL VEIN
UPPER RADIAL V.
LOWER RADIAL V.
MEDIAN V
SUBMEDIAN VEIN
INTERNAL VEIN
MEDIAN NERVULES
1.
2.
3.
FRINGES
SECONDARY.

FIGURE A78

# THE GROSS ANATOMY OF BUTTERFLIES

THE beginner will find it necessary to become familiar with a few of the terms used in describing the various portions of the butterfly. It does not seem advisable to cover the more technical phases of the subject in this work.

The body of a butterfly is composed of three divisions named respectively the head, thorax and abdomen. Long processes known as feelers or *antennae* extend forward from the head. Back of the head is the *thorax* which is separated from the *abdomen*, or hindmost portion, by a constriction. The head end is also called the *anterior* portion and the abdominal end the *posterior* extremity.

When the butterfly is at rest in a horizontal position with its wings extended, the surface which is uppermost is called the *superior* surface, the opposite or lower surface is called the *inferior*. A line drawn through the center of the body is spoken of as the *median* line. Any structure which is located away from or toward the side of this line is *lateral* to it. Thus the outer edge of the wing is *lateral* to the butterfly's body, and conversely the body is *medial* to the wing.

The three major divisions of the body are each made up of a number of named parts, only the most obvious of which are here considered.

The head of a butterfly has at its sides two large compound eyes, between which are the *antennae*. Projecting forward are two small tufts known as the *labial palpi*. Underneath the head is a spirally coiled apparatus called the *proboscis*.

The central portion of the body, or *thorax*, has on its lower portion three pairs of legs. This lower surface is called the *ventral* surface. The upper, or back portion, is spoken of as the *dorsal* surface.

The *abdomen* is composed of joints or *segments*. At the *posterior*, or hind end, is placed the genital organs which are collectively known as the *genitalia*. In male butterflies these are covered by two plate-like structures or *claspers*, which serve to distinguish the sex.

The *wings* are attached to the side of the thorax. The front or forewing is called the *primary*, and the hindwing the *secondary*.

The wings are of different shapes, the primaries being more pointed at the outer front end, which is designated the *apex*. The part attaching to the body is called the base. The front edge is called the *costal margin*, the outer edge is the lateral or *outer margin*, and the back edge is the *inner margin*.

Where the outer and inner margins join, an angle is produced known as the *inner angle*.

Along the outer margins of both wings there are long scales which project from the wing and make up the *fringes*.

The hind wing or *secondary*, is variously shaped. In the Swallowtails, it has a long posterior projection known as the *tail*, but in the majority of species is rounded.

Most of the terms applied to the primary are also applicable to the secondary. Thus the *costal margin* is the front edge, and the inner margin is that which rests close to the abdomen.

The inner angle is sometimes called the *anal* angle.

There is no apex on the secondary, the point of juncture of the costal and outer margins being called the *outer angle*.

In order to localize certain marks occurring on the wings of butterflies they are usually divided into three areas. The outer third of the wing is called the *limbal* area, the middle or center third is the *discal* area, and the inner third is designated the *basal* area.

If the wing of a butterfly is pressed between the fingers a powdery substance is rubbed off. Under high magnification this is seen to be composed of *scales*, which are formed in a variety of shapes. The color of the wing is contained in these minute structures. If the wing is freed of these scales it is seen to be composed of a thin colorless membrane, strengthened by numerous tube-like structures which are variously designated *veins* and *nervules*. The arrangement of these partly determines the classification of butterflies.

## EARLY STAGES

The four stages through which a butterfly passes in the course of its development are termed (1) egg or ovum, (2) caterpillar or larva, (3) chrysalis or pupa and (4) imago or butterfly. The complete cycle of this development is known as the *metamorphosis*.

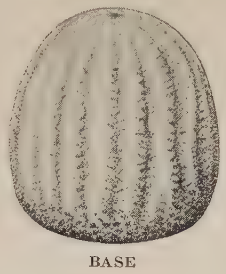


FIGURE A79
Egg of *Oeneis ivallda*
Highly Magnified

Egg. The structure of this varies in different genera. The usual shape is spherical or oval. The portion which is in contact with the leaf or bark on which it is laid is called the *base*. At the opposite end from this is a minute opening, often resting in a depression. This is known as the *micropyle,* and represents the point through which the fructifying sperm cell passes to insure fertilization.

Caterpillar. The body of the caterpillar or larva differs from that of the butterfly in several particulars. There is no separation of thorax and abdomen, hence the main divisions are a *head* and a *body*. The upper or back part of the body is known as the *dorsum,* or *dorsal* region. The under surface is termed the *abdominal* region. The body is divided into numerous *segments* or joints. On each of the first three occurs a pair of legs, which are known as the *forelegs* or true legs, and correspond to those which persist in the butterfly. Back of these are (in most cases) five pairs of soft fleshy legs which are designated *prolegs*. The hindmost pair, which are some distance removed from the others are the *anal prolegs*.

A careful examination of the caterpillar will disclose a number of minute openings arranged along each side. These are the breathing holes or *spiracles*.

Caterpillars cast their skins several times before reaching maturity. The process is called *moulting*. The appearance of the larva may change with each successive moult. The span of time between each moult is known as an *instar*.

Chrysalis. The third stage in the development of a butterfly is designed primarily to carry it over a period of cold or drought.

Most butterflies overwinter as pupae, but a few have varied the procedure and spend the winter as eggs or caterpillars.

The various portions of a chrysalis have practically the same designations as are applied in the case of the caterpillar. There are no legs, however, and the wings are small structures contained within the *wing cases* and tightly compressed against the body. The hind end or anal extremity is protruded into an apparatus containing minute hooks that is called the *cremaster*.

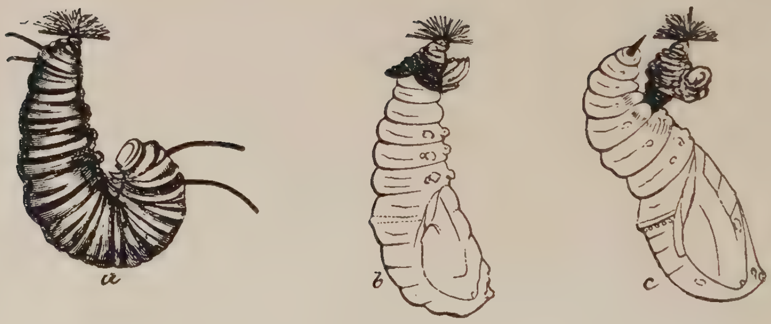


FIGURE A80

The Monarch Butterfly, Showing the Last Larval Moult and Change to the Chrysalis

# ORIGINAL DESCRIPTIONS

IT IS frequently a matter of great difficulty for the research worker in the field of Entomology to locate original papers in which the descriptions of new forms first appeared. This is primarily due to the fact that it is customary for scientists to publish their papers in technical journals of rather restricted circulation. Often an author will favor a number of different publications, in consequence of which his writings are widely scattered. Many of the technical journals are soon out of print, and the earlier numbers quickly become unobtainable.

To carry on zoological investigations it therefore becomes necessary for one to have access to specialized libraries, or else, to acquire a large collection of rare and expensive works.

In the Pacific states there are very few technical libraries that are comparable to those of the far east.

It has therefore seemed desirable to reprint all of the original descriptions of the several species, races and forms of butterflies that have resulted from the author's investigations, in order that they may be readily accessible within the pages of a single volume.

These reprints will be of little significance to the amateur, but, on the other hand, they may afford a considerable saving of time and expense to the research worker.

A few of the species included in this section are not found in California, and are therefore not considered in the preceding portion of the book.

## A NEW SPECIES OR RACE OF ARGYNNIS FROM CALIFORNIA*

My friend, Mr. George Malcolm, has presented for my consideration some very interesting lepidoptera which he collected in the Mammoth district. Two trips were made into this region, which is one of almost virgin ground for the entomologist. Mr. Malcolm is a keen observer and careful collector, and his zeal has resulted in the discovery of several new locality records, and at least one new species, which I take pleasure in naming after him.

---

*"Southwest Science Bulletin," May 5, 1920.

## ARGYNNIS MALCOLMI, SP. NOV.

MALE, expanse 2¼ inches, 57 millimetres.

UPPER SIDE; PRIMARIES: Uniform yellow-brown. Nervules very slightly powdered with dark scales, this powdering indistinct or totally lacking over apical area, and at base. Marginal band, a faint double line, nearly suppressed at apex. A sub-marginal row of crescents, the anterior three partly or wholly suppressed. A limbal row of six circular spots, the posterior three large, the anterior tending toward suppression. A wavy extra-discal band of black, discontinuous at nervules, and widest in the median interspace where it measures approximately 2 millimetres. An inverted P at outer edge of disc,—internal thereto the disc is crossed by three irregular bands. The base, slightly shaded with brown, where the nervules are similarly colored.

UPPER SIDE; SECONDARIES: Ground color same as primaries. No shading on nervules. Fringes cream-colored except at nervules where they are yellow-brown. A narrow marginal line, more clearly defined anteriorly, fading out toward anal angle. Six or seven submarginal crescents. A limbal row of five circular spots, the central one tending toward extinction (totally missing in one specimen). Subdiscal band distinct and more or less connected, widest posterior to the disc. At outer edge of disc an inverted U or V. Base, uniform brown of a shade slightly darker than ground color.

UNDER SIDE; PRIMARIES: Ground color, creamy-buff in apical half, chocolate to reddish brown in discal half. The fringes cream, interrupted with dark brown at nervules. Marginal row, a fine double line of brown. Submarginal row of cream-colored oval spots showing in some specimens a slight silver scaling, but in the majority no silver whatsoever,—these bordered internally by a line of eight brown crescents, the posterior two darker. Two subapical silver spots, with a shaded border of brown. The limbal row of circular spots reduced to three. The spots and bands of black in discal and basal areas carried through from upper side.

UNDER SIDE; SECONDARIES: Completely silvered. Ground color, creamy-buff, with a liberal mottling of brown in the basal two-thirds of wing. Fine double marginal band. The submarginal silver row of seven ovals, shaded internally by brown crescents. The discal and basal silvered spots shaded internally by fine black lines.

FEMALE, expanse 2 7/16 inches, 62 millimetres.

UPPER SIDE; PRIMARIES: Differ from male principally in the fact that the ground color is lighter and less uniform and the dark markings are not suppressed over the apical area. There is also a row of eight yellow-brown submarginal ovals, corresponding to a silvered row on the under surface.

UPPER SIDE; SECONDARIES: Similar to male except for lighter and less uniform ground color.

UNDER SIDE; PRIMARIES: Differ from male in having a well silvered submarginal row of spots, and in the richer red-brown of the basal half of wing.

UNDER SIDE; SECONDARIES: Same as male, except for a slightly greater amount of brown in the ground color of the basal two-thirds of wing.

This species is related to montivaga, and may, of course turn out to be a geographic race of that species.

Described from 10 males and 4 females taken by Mr. Geo. Malcolm, as follows:

8 at Mammoth, Cal., Aug. 1st to 18th, 1918 (The type, Aug. 18th).
1 at Dead Man's Creek, Mono Co., July 27, 1919.
4 at Casa Diablo Lake, Mono Co., July 22, 1919.
1 at Silver Lake, Mono Co., July 22, 1919.

Type, in the author's collection, Southwest Museum. Cotypes in the George Malcolm Collection, Los Angeles, Plate 1, figure 4 male, figure 5 female, figure 6 male, under side.)

## ARGYNNIS TEHACHAPINA, VAR. NOV.*

During the summer of 1918 I made some extensive collections of Lepidoptera in the Tehachapi Mountains of Kern County, California. Most of the time was spent in the lower canyons of the Range at an altitude of 5000 to 6000 feet, but three ascents were made of the peaks. The highest of these is 7994 feet, and is reached with difficulty through a rough brushgrown country. It is heavily timbered on its upper few hundred feet.

---

*"Southwest Science Bulletin," May 5, 1920.

On July 15th I noted some six or seven small Argynnids playing about the rocks at the extreme tip of this peak. After considerable difficulty four of them were captured. They turned out to be a very distinct form from any other member of the genus found in the same locality. I am convinced, after a considerable study of the specimens, and of others closely related, that it is a race deserving of a separate name. It may be described as follows:

**Argynnis montivaga, var. tehachapina, N. var.**

Male: expanse $1\frac{5}{8}$ to $1\frac{3}{4}$ inches, 41 to 44-5 millimetres.

Upper Side; Primaries: Uniform yellow-brown. Nervules widely margined with black. Fringes cream between nervules, black at base of nervules. Marginal band, two fine lines nearly fused into a single wide band, and completely fused at nervules. Internal to these a submarginal row of seven or eight oval brownish-yellow spots bordered internally by triangular black spots placed medially between each nervule, the anterior two indistinct. A limbal row of six circular black spots. A wide wavy extra-discal band of black, concave outward in 3rd median interspace, concave inward in 4th and 5th median interspaces. An inverted P at outer edge of disc; internal thereto an angular black line; subdiscally a black irregular oval with brownish center. The base, delicately shaded with blackish scales.

Upper Side, Secondaries: Ground color same as primaries. No shading on nervules except along base of upper discocellular. Marginal lines distinctly double; submarginal oval spots only complete on anterior part; open as anal angle is approached. The black triangular submarginal spots irregular, the anterior one tending to be quadrate, the next five more uniform, the seventh indistinct. The limbal row of black dots very irregular, the one between upper and lower radial nervules very large, the next smaller, and the third minute, 4th and 5th distinct. The subdiscal band of primaries is continued on secondaries not as a band, *but as a series of five elongate dashes,* showing very little tendency to connect and form a line as in other members of the group. At outer edge of disc a black quadrate spot, connected by a fine line with the upper discocellular. Internal to this spot a faint suggestion of another. Base finely powdered with black scales.

UNDER SIDE, PRIMARIES. Ground color, brown, lightened along costal and subcostal margin with a creamy-buff. Marginal lines brown; oval spots cream buff, bordered internally with dark brown triangles, the posterior two darker in color. Wavy subdiscal black band of upper side repeated, but wider; bordered externally with a shading of cream-buff, except in posterior interspace. The limbal row of black circular spots are reduced to three or four.

The subapical area is shaded with a ground color of deep brown. Other markings as on upper side.

SECONDARIES. Unsilvered, except for a slight suggestion on submarginal ovals. Fine double marginal lines, bounded internally by a line of seven oval cream colored (or slightly silvered) spots,—these in turn bounded by seven triangular brown spots, encroaching on a limbal band of creamy-buff. Ground color of discal and basal areas is *deep brown,* lightened in certain areas by creamy-buff scales. An outer discal row of seven irregular oval spots, creamy buff, the fourth reduced to a mere spot,—and the posterior one very irregular. These are all shaded medially with black scales, and laterally with slight suggestion of brown. Three large irregular spots of same color occur on inner side of discal area, and three small spots, the center one only distinct, are placed in the basal area. Abdomen, brown above, yellow-brown below. Thorax blackish-brown above, yellow-brown below.

FEMALE. Expanse 2 inches, (51 millimetres).

UPPER SIDE, PRIMARIES. Differs from male as follows: Ground color slightly lighter, particularly in costal and subcostal area which is slightly yellowed, fringes nearly white where cream colored on male. Nervules not bordered with black, and reduced to delicate lines, submarginal oval spots, yellow brown.

SECONDARIES. Submarginal ovals lighter than ground color.

UNDER SIDE PRIMARIES. Posterior half, ground color, red-brown, anterior half, cream-buff. Submarginal ovals, slightly silvered anteriorly.

SECONDARIES. Submarginal ovals more or less silvered, also spot in center of disc, which is double instead of single. Ground color of basal and discal areas slightly more of a purplish brown than on male.

Described from three males and one female, taken on highest peak in Tehachapi Mts., July 18, 1918. In the collection of the author, Southwest Museum, Los Angeles.

This is a southern, unsilvered race of Montivaga in my estimation. It differs from the typical in the following points:

| **TEHACHAPINA** | **MONTIVAGA** |
|---|---|
| **Upper Side — Primaries — Male** | |
| Marginal lines tending to fuse<br>Submarginal oval spots narrow<br>Extra-discal black band narrow<br>Marginal lines usually double | Submarginal ovals wider or open (variable)<br>Extra discal black band nearly half again as wide |
| **Upper Side — Secondaries — Male** | |
| Limbal row of round spots reduced, the anterior one largest | Limbal row of round spots prominent, the posterior two largest |
| Extra-discal black wavy line reduced to five discontinuous oblongs | Extra-discal black wavy line continuous, sharply defined |
| Black markings at outer angle of disc reduced | Black marking at outer angle of disc a heavy inverted V or Y |
| **Under Side — Primaries — Male** | |
| Ground color, chocolate brown with blotches of creamy-buff | Ground color, creamy-buff, with shadings of yellow on posterior half |
| Extra-discal line wider on under side than on upper. | Extra-discal line narrower on under side than on upper |
| **Under Side — Secondaries — Male** | |
| Typically unsilvered | Typically silvered although unsilvered forms, and all intergrades, occur commonly |
| Ground color, brown | Ground color, creamy-buff |
| Limbal creamy-buff band reduced and inconspicuous | Limbal creamy-buff band wide and clear |

This is not the unsilvered form of macaria, which Wright describes under the name of laurina. I have examined a cotype of Wright's laurina through the courtesy of Prof. Van Duzee, of the California Academy of Sciences, and find that it does not differ from typical macaria except for the lack of silvering—and a glance at the accompanying plate will serve to distinguish macaria from tehachapina (Plate 1, figures 7-8-9 tehachapina*).

---

*The plate numbers refer to the colored illustration in the original article.

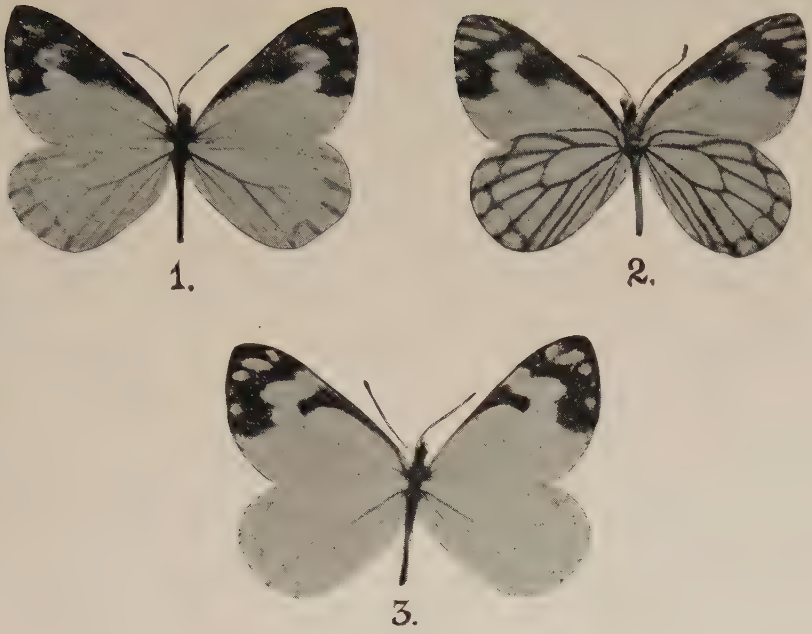


PLATE IV
(of the original article)

## A New Aberration[*]

NEOPHASIA MENAPIA FELDER, F. NIGRACOSTA ABERR. NOV.

Plate IV, Figure 1, upper side. Figure 2, under side[†]

Primaries, upper surface, differ from typical form as follows: The black bar running along the costal margin is broadened as a suffusion posteriorly over the anterior half of the discal cell. It also is extended outward toward the apex entirely obscuring the white of the subcostal area. This suffusion results in a partial obliteration of the white marginal spots, and a marked blurring of the white submarginal area between the discal cell and the apex. The under sides of primaries show all the suffused areas carried through but to a lesser degree. The white marginal spots are not involved, however, in this suffusion.

Secondaries, upper surface shows a slight tendency for the dark venation to carry through from below, along the marginal area, this feature varying a little in the two specimens before us. The under side of secondaries shows a tendency for heavier lineation of the nervules.

---

[*] "The Lepidopterist," Vol. II, No. 2. Feb. 25, 1918.

[†] The original plate numbers referred to a black and white illustration appearing in the above issue. Nigracosta is pictured in this work on color plate No. 7, figs. 4 and 7.

Described from two males collected by the author in the high Sierras of Tulare County, California, altitude 9,000 to 10,000 ft. (near Olancha Peak).

Plate IV Fig. 1, August 20, 1917. Fig. 2, Aug. 25, 1917. Fig. 3 shows a normal male for comparison. Types in the author's collection at the Southwest Museum, Los Angeles, Cal.

## Melitaea anicia: Two New Aberrations*

Mel. anicia Dbldy. & Hew.

*MELANODISCA aberr. nov.*

Plate VI. Figure 1, upper side. Figure 3, under side.
Figure 2 shows upper side of typical form.†

This aberration is of the typical form of anicia which has heretofore gone under the name of *brucei* Edw., namely the small dark high alpine variety found in Colorado, and which Drs. Barnes and McDunnough have shown to be synonymous with the type.

DESCRIPTION. *Primaries, upper surface*: the discal cell contains two red patches, one at the lateral end, the other running across the center. The remainder of the discal cell and also the entire discal area is solid black. In the limbal area the black band of the typical form is replaced with a brick-red and the outer row of yellow spots is nearly suppressed. The inner row remains but is considerably blurred, and is a little more prominent on one of the two specimens before us (Figure 3) than on the other.

The submarginal black line is intact, but blurred, and the marginal line of red is much as in the typical form. The nervules are finely dusted with black.

*Secondaries, upper surface*: all of the typical yellow markings are completely suppressed and their places taken by a black suffusion. The entire wing, in fact, is a solid black with the exception of the marginal band of red, one row of red spots running through the center of the limbal area, and a single blurred irregular red spot in the outer and upper portion of the discal cell.

---

*"The Lepidopterist," Vol. II, No. 5. May 25, 1918.

†The plate numbers refer to the halftone used in the original article. See page 270.

*Primaries, under surface*: much as in the typical, but with the yellow of the discal area largely suppressed, and its place taken by a dark powdery suffusion, more marked anteriorly. The limbal area has the reds and yellows blurred and indistinct. The submarginal black line is blurred, and partially or nearly suppressed.

*Secondaries, under surface*: all of the yellow spots of the basal and discal areas have been suppressed, and their place taken by an irregular mottling of black and brick-red. The line of red spots running through the limbal area on the upper surface is repeated below but is more clearly a line, also it is margined with yellow. The marginal red border is intact, and internal to it there is a clearly defined black band, varying somewhat in width on the two specimens.

Described from two females, both taken by the author in Hall Valley, Colorado, at an elevation of about 10,000 feet. Figure 1, taken July 18th, Figure 3 taken July 20th, 1902.

Types in the author's collection, Southwest Museum, Los Angeles, Cal.

### *RUBROLIMBATA aberr. nov.*

Plate VI, Figure 4, under side.

This aberration, I am inclined to believe, is of the race of anicia termed capella Barnes, which occurs not uncommonly at lower levels than the typical form in Colorado.

*Primaries, upper surface*: all of the yellow spots suppressed except for one line which runs across the inner portion of the limbal area. There is a repression of the black bands and mottlings of the limbal area, giving the appearance of a brick-red wide margin. The venules, however, are edged with black, and there is also a fine black submarginal line. The basal area is predominantly brick-red, with black lines crossing the discal cell, and a darker powdering at the inner edge of the area. All yellows in this area are suppressed.

*Secondaries, upper surface*: all yellow spots and lines are wanting, and all black bands in the limbal area missing except for the black lineation of the nervules and a submarginal narrow band. This gives the same characteristic brick-red wide margined appearance as that of the primaries, which is further heightened by an almost complete suffusion of the basal, and inner part of discal area with black. One semilunar red spot only occurs in the outer part of the discal cell.

*Primaries, under surface*: not dissimilar to *melanodisca* except for the lighter color of the discal cell and costal area.

*Secondaries, under surface*: the black bands and spots of the typical form have been suppressed except for the striping of the nervules, a fine line running around the basal area, and a narrow submarginal stripe. The marginal and discal areas are a solid yellow crossed longitudinally in the center by a red band. The basal area is predominantly brick-red, with some irregular yellow spots margined with black. The pattern is well brought out in the plate. (Fig. 4.)

Described from one male, taken by the author in South Park, Colorado, July 13th, 1902.

Type in the author's collection, Southwest Museum, Los Angeles.

Figure 5 represents an interesting variation of *Melitœa nubigena Behr*,—figure 6 representing the typical form of this species. Both the specimens are males. In the variation it will be noted that a blurring of the outer submarginal row of yellow spots has occurred on the primaries. There is also a widening of the red band in the limbal area of the secondaries.

The specimens were taken by the author in Tulare County, Calif., August, 1917, at an elevation of 8,500 feet.

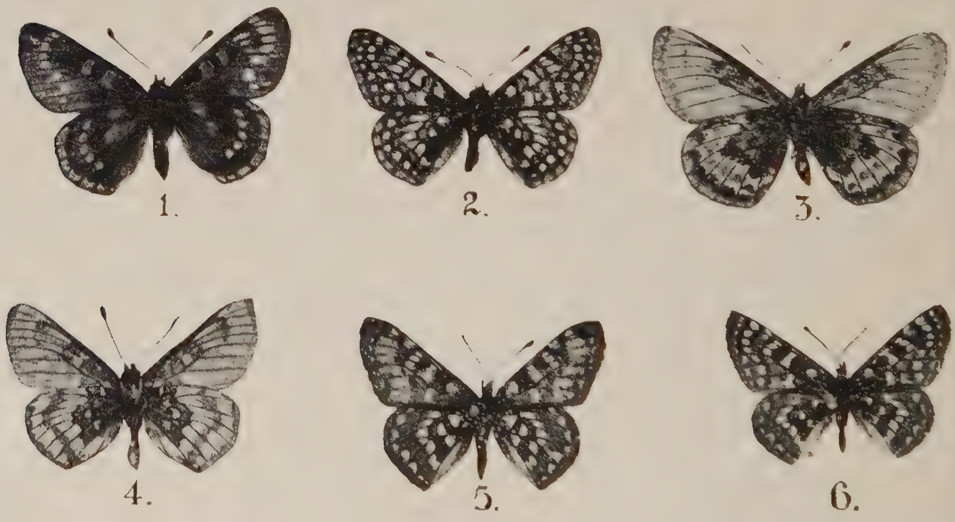


PLATE VI
(of the original publication)

## ORIGINAL DESCRIPTIONS

### Notes on the Pola—Minuta Group of Melitaeas,* With Description of a New Species

In examining a series of Melitæa secured in the Monache Meadows of Tulare County, during the summer of 1917, I was led to an intensive study of the Pola-Arachne-Nympha group.

The result of this investigation has led to the conviction that we have in California a distinct species, or perhaps well differentiated local race of this group.

In defining the special characteristics of these nearly related forms, a few notes are in order.

The various members of this group which have received descriptions are:

MELITÆA
- minuta, Edwards
    - Proc. Acad. Nat'l. Sciences, Phila. 161, 1861.
    - Type loc. "Texas"
- pola, Boisduval
    - Ann. Soc. Ent. Belg. xll, 56, 1869.
    - Type loc. "From one specimen caught in Sonora."
- arachne, Edwards
    - Trans. Am. Ent. Soc. 11, 372, 1869.
    - Type loc. "One female, Colorado."
- nympha, Edwards
    - Pap. IV, 53, 1884.
    - Type loc. So. Arizona.
- approximata, Strecker.

Authorities are agreed that approximata is synonymous with minuta.

†The clearing up of a long standing misidentification of minuta and pola has resulted from Drs. Barnes and McDunnough's figures and notes on the two species (Contrib. Vol. III, No. 2, p. 92). Oberthur's figure of the type of pola (Et. de Lep. Comp. IX, 2, Fig. 2188) is practically the same as W. G. Wright's figure of so-called minuta (Pl. XX. Fig. 194.) The specimen shown was taken in Southern Arizona. The true type locality of pola is doubtful. Dr. Skinner believes it was Sonora, Mexico, and Drs. Barnes and McDunnough "anywhere in the desert region of southeast California." We have

---

*"The Lepidopterist," Vol. II, No. 7. July 25, 1918.

†The remaining portion of this paper was continued in "The Lepidopterist" of Oct. 25, 1918. (Vol. II, Nos. 9 and 10.)

seen specimens identical with this figure from Arizona, close to the California border, in the lower Sonoran life-zone. These are doubtless as near topotypes as can be secured. They do not differ in any particular from specimens we have taken in the lower zones throughout Colorado.

Dr. Henry Skinner believes arachne to be a synonym of pola. Drs. Barnes and McDunnough retained it in their list as a race of pola, but they have in recent letters affirmed that there seems to be no essential difference. It is safe therefore to place arachne as a synonym. This would leave only nympha and minuta to consider.

From Drs. Barnes and McDunnough's notes, and from specimens taken at Comfort, Texas, I am convinced that minuta is a very distinct form, not represented outside of a limited territory in Texas. (Fig. 4.)

From specimens of nympha collected in west Texas which match Edwards' description fairly well and are not dissimilar to the figure shown by Wright (Pl. XX. F. 191, "So. Ariz.") I would judge this form to be more closely related to pola than to minuta. We possess specimens from Colorado tallying with this form on the upper side, but which have a much greater proportionate area of cream-white on the under surface, showing distinct pola affiliations. Intergrades between these forms occur. (Figures 5-6.)

I believe the forms characterized by dark ground color with a band of whitish through the discal area may be considered typical nympha, and the lighter checkered forms with two shades of buff spots as a ground color may be accounted typical pola.

Our Tulare County captures differ from all of the above in several particulars, and may be described as follows:

Melitæa monache sp. nov. Figures 1 to 3.

Male. Upper side. Primaries, ground color uniform ochrous, crossed by numerous irregular fine black lines. Outer margin fringed with alternate black and white, the black at ends of nervules, with the white slightly in excess. Fine double marginal stripe tending to fuse into a single black wide marginal line. Limbal area, nervules very finely lined with black. A series of irregular narrow broken black lines crossing the limbal area at right angles to the fine striped nervules, which marks off a series of irregular squares and oblongs. The outer band of yellow thus defined is, however, made up of dentate rather than squared spots. The black lines are partly or completely wanting between the 2nd and 3rd median nervules (more marked in the female). In the inner portion of discal area a heavy tortuous black line shaped somewhat as a cupid's bow, tending to be interrupted at the 3rd median nervule. At the outer end of discal cell an irregular ochrous oblongate spot bordered with black. Discal cell crossed by two wavy black lines. At the base of the cell a narrow black constricted O enclosing an ochrous spot. Below the discal cell an irregular figure 8.

Upper side. Secondaries. Fringe and marginal lines as on primaries. Nervules, narrow black lines. Two constricted lines crossing the limbal and outer part of discal areas, more regular than the lines on primaries, and dividing this portion of the wing into an outer band of ochreous oblongs, a middle band of more or less regular squares, and an inner band of oblongs. Internal to this a wider band of black, closing in the end of the discal cell at its center.

A round or oval ochrous spot edged with black occupies the center of the discal cell. Inner portion of basal area blackish.

Inner margin light ochreous toward the anal angle, tending to black toward the base.

Both primaries and secondaries are quite uniform as to the ochreous ground color, the ochre greatly in predominance over the black. There are no lighter colored spots as in pola (arachne) and the wings have the appearance of being striped irregularly with black, rather than checkered. Furthermore, the secondaries are not markedly darker than primaries as with the average nympha. Pola (arachne) shows characteristically the "deep fulvous sinus in discal cell of secondaries" (variable) while monache always shows the centrally placed O.

There is no "whitish" band on upper side of secondaries in monache as with pola.

Under side.* Primaries. Similar to pola, but the ochreous color of the basal and discal areas is a little richer, and the yellowish-white is confined to a narrow subapical area.

The same four bands of cream-white occur on secondaries as are found in pola, but the marginal band tends to be wider (not distinctly composed of crescents as in arachne). The centrally placed wide light-colored band is relatively narrower than in pola, and is bordered by wider, more nearly complete black lines.

---

*The original description erroneously printed this "upper side."

The outer black border in particular is practically an unbroken line in monache. The basal whitish patch is almost obsolete.

Palpi and abdomen much as in pola. Antennæ show a shade more ochre.

Female similar to male, but with slightly greater wing expanse. Our specimens of both sexes show a variation in expanse of from 1⅛ to 1⅝ inches.

Described from one male and ten females, taken at 8,500 to 9,000 feet elevation, in the Monache Meadows of Tulare County, California, during August of 1917. The district is about 25 miles south of Mount Whitney.

Types in the author's collection at the Southwest Museum, Los Angeles.

A differential table of the three forms follows.

(Omitted from lack of space.)*

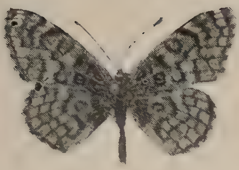
Monache is not reported north of Mt. Whitney or south of the Tehachapi range, and would seem to be confined to the high valleys of Tulare County immediately south of Mt. Whitney.

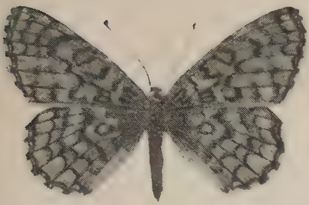
No related forms are found in the desert regions adjoining unless it be close to the Arizona border, where no doubt typical pola may later be reported.

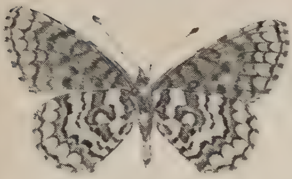
---

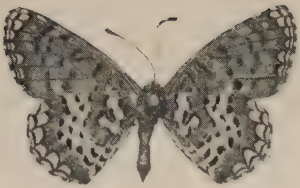
*This omission in the original article is corrected below:

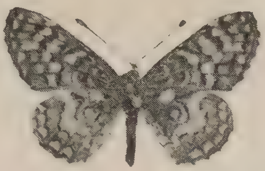
| | MINUTA | NYMPHA | POLA | MONACHE |
|---|---|---|---|---|
| GROUND COLOR SUPERIOR SURFACE | Uniform deep ochraceous. | Two shades—light buff and ochraceous. | Two shades of ochraceous. | Uniform ochraceous. |
| FRINGES | Checkered | Checkered, creamy scales in excess of the black. | Checkered, creamy scales in excess of the black. | Checkered, black and cream in nearly equal proportions. |
| GENERAL FACIES | Striped | Checkered | Checkered | Striped |
| Central Light Band of Under Side of Secondaries | With three rows of parallel black dots. | Outer and inner edge lined with narrow black interrupted borders: central spots nearly obsolete. | Outer and inner edge lined with narrow black interrupted borders: central spots nearly obsolete. | Heavy continuous outer and inner black border: central line continuous except in middle portion. |

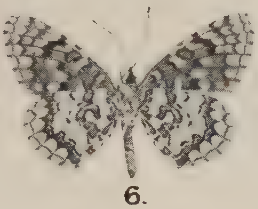

1.

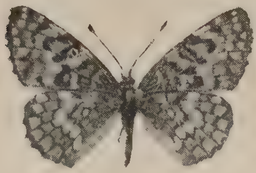

2.

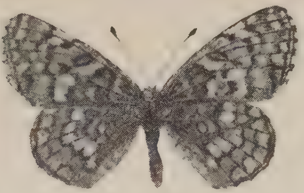

3.

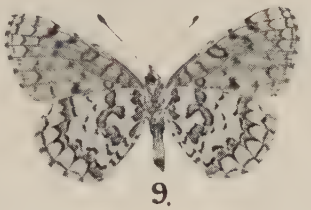

4.


5.


6.


7.


8.


9.

1. Melitæa monache type) ♂, Monache Meadows, Tulare Co., Cal., Aug. 3, 1917.
2. Melitæa monache (type) ♀, Monache Meadows, Tulare Co., Cal., Aug. 3, 1917.
3. Melitæa monache ♀ underside, Monache Meadows, Tulare Co., Cal., Aug. 7, 1917.
4. Melitæa minuta ♂, underside, Comfort, Texas, July 27, 1901.
5. Melitæa nympha ♂, So. Arizona.
6. Melitæa nympha, Sulphur Springs, Colo., July 25, 1900.
7. Melitæa pola ♂, Floyd's Hill, Colo., Aug. 26, 1902.
8. Melitæa pola ♀, Colorado, 1902.
9. Melitæa pola ♀, underside, Sulphur Springs, Colo.

# STUDIES IN PACIFIC COAST LEPIDOPTERA

Notes on the acmon-neurona group of Lycaenids, with description of a new species.*

The relationship of the six species and one variety of Lycaenids comprising this group has been obscure, and several papers written to clarify the matter have unfortunately further complicated the problem. This lack of clarity results in part from the extremely brief descriptions of the earliest published species, and to some extent, from the small series which were available to the several authors who have written on the problem. An exact knowledge of the inter-relations of the group will not be possible until a long series of each species has been bred under varying conditions of climate, altitude and season, but certain conclusions may be reached by a comparison of series covering a wide geographic range.

Plebeius acmon is too well known to deserve comment. Mr. Victor L. Clemence has given valuable notes on the species and its seasonal forms in the "Canadian Entomologist," Vol. XLI, p. 38, 1909. He has pointed out the fact that the early spring form is "small in size, of a darker blue than the type form, and heavily margined in black." His remarks refer, of course, to the male only. The female of this form tends to have the basal portion of primaries and secondaries heavily shot with blue, whereas the later generations are uniform slatey-brown. In the male of these later forms, the ground color is a delicate violet, and the orange band on upper side of secondaries is overshot with rose.

Boisduval's *antaegon* refers to the summer form and is undoubtedly synonymous with acmon.

Grinnell's *cottlei* is a race of *acmon* occurring in the San Francisco Bay region (the types taken at Baker's Beach). It is an early spring form, and can be distinguished from the typical by the "intensity, sharpness and distinctiveness of the deep purplish blue, the heavy black border; the greatly extended deep red border of the hindwings; and darker ashy-gray and distinct markings of the under sides."

Boisduval's *lupini* is undoubtedly an alpine race of acmon occurring at points in the high Sierras. In size it averages as large as *monticola*. It is difficult to separate from large specimens of the summer form of acmon, but a few points of differentiation seem fairly constant. In the male it is noted that the marginal dark band on upper side of primaries gives place gradually to the violet-blue ground color. This marginal band is also wider than in other forms of acmon. The orange band on upper side of secondaries is bordered internally with a dark shading and the color is distinctively orange whereas in typical acmon it shows a rosy lustre and is not usually internally shaded.

---

*"Bulletin, So. Calif. Academy of Sciences," Vol. 21. No. 2, Sept., 1922.

PLEBEIUS MONTICOLA Clemence is a well defined mountain race of acmon occurring in the Southern Sierras, the type locality being the San Gabriel Mountains. It may be distinguished from other varieties by the silvery-blue ground color, the broad marginal band on upper side of primaries, and in the female, which is almost as blue as the male, by the broad orange band of upper side of secondaries. Both sexes show relatively heavier markings on the under side than do other forms of acmon.

PLEBEIUS CHLORINA Skinner is a form that has been much misunderstood. Dr. Skinner's first description, occurring in the "Entomological News," Vol. 13, p. 15, 1902, erroneously spoke of the *female* having an "overlying iridescent, very light green." This was later corrected in W. G. Wright's "Butterflies of the West Coast," where Dr. Skinner is quoted as saying "my three specimens are males." Undoubtedly the original description was of a male rather than a female as originally stated. I have a long series of this form from the type locality in the Tehachapi Mountains. The males could be considered as monticolas in which the silvery-blue had changed to a lustrous blue-green. On the under side of the wings they can not be distinguished from typical acmon. In size they are intermediate between typical acmon and monticola. The female which seems to be associated with this greenish male (though none were taken in copulation) is almost identical with large sized specimens of the summer form of acmon. The ground color of the former is perhaps more brown and the orange band on upper side of secondaries uniformly wider. Only one specimen shows a slight powdering of greenish scales on the primaries, (in the basal area). All the others are a uniform brown. There is wide variation, tending on the one hand to small specimens that are indistinguishable from acmon and on the other to large, orange-suffused examples that approach typical females of neurona.

One remarkable variation in the male, evidenced by five specimens in my series is sufficiently distinct to deserve a varietal name. I will therefore designate this.

**Plebeius carolyna**, form nov: naming it for my loyal co-worker and wife, Dr. Carolyn Comstock, who captured three of the five specimens in my series.

Expanse—19-25 mm.

Upper surface as in typical chlorina, i. e., ground color, lustrous blue-green; outer margin brown; fringes white. *The nervules on outer third or fourth of primaries, orange* (as in neurona) beginning at a point about one mm. internal to outer margin, these orange lines expand as they approach the junction between the bluish-green ground color and the marginal band; they again gradually diminish as they approach the limbal area, until they finally disappear. Secondaries, ground color bluish-green. Outer marginal orange band wide, and bordered internally with 5 points of shading in juxtaposition to the five submarginal round spots. A dark fine marginal line. *Under surface,* as in typical chlorina. Thorax, dorsal surface blackish covered with filamentous greenish scales; beneath, greyish-fawn. Abdomen, dorsal surface dark shading to grey laterally, ventral surface, silvery grey.

Antennae, clubs black, segments annulated black and white.

Type locality: Tehachapi Mts. about five miles from the town of that name. Elevation 5,000 feet. The type taken on July 1st. Paratypes 1, 2, 3 and 4, taken respectively on July 7, July 11, and July 22.

Type and paratypes in the Southwest Museum Collection.

This form is in practically all respects similar to chlorina, but may at once be distinguished by the orange lineation on the nervules in outer portion of primaries. Possibly it may have arisen as a result of interbreeding with neurona, which is found in the same locality.

**Plebeius emigdionis**, Grinnell. Ent. news, Vol. 16, p. 115, 1905.

This species was first described by Fordyce Grinnell, Jr., from specimens taken in San Emigdio Canyon, Kern Co. Doubt was later thrown on the validity of the species by Mr. Karl Coolidge's notes in the Entom. News of 1907, Vol. 18, p. 300, who states "a later examination of Mr. Grinnell's specimens proves them to be all females, and - - - - - emigdionis is probably only a variety of acmon."

I have taken this species in Mint Canyon, and also have a good series from Victorville, Mojave Desert, (taken in May of this year) where it flies in abundance. It is undoubtedly a valid species, totally distinct from acmon, which also occurs in the same district. Its flight is more energetic and its habits very different. The male and female may be easily distinguished, as a glance at the accompanying plate will determine. I have taken several pairs in copulation.

It differs markedly from all forms of acmon in several particulars, chief of which are:

In the male, the blue scales on upper surface are concentrated most heavily in the basal area and gradually give place to the dark marginal shading. The marginal orange band on secondaries of acmon is represented only by a brownish or yellow-brown suffusion on which are slight shadowy suggestions of dark spots. The type specimen has three such spots suggested, but the majority of the males show only one or two. On the under surface we find the ground color practically alike in the two sexes, whereas in acmon the ground color of the males is lighter. Another striking point of difference is the series of black spots distal to the reniform discal dash. In both sexes of emigdionis these are fully twice the size of the marginal series and are irregularly cuneiform, whereas in acmon they are relatively much smaller, oval in form and more evenly aligned. A clear distinction rests in the five submarginal metallic rings on under side of secondaries which are relatively much larger in emigdionis than in any form of acmon. The "orange" crescents internal to these are reduced to about $\frac{1}{2}$ mm. and are not orange but yellow. The upper surface of female may be separated from acmon by the broad outer yellow-brown suffusion which gradually diminishes in the limbal area. This suffusion is somewhat more concentrated along the lines of the nervules and gives a slightly "neurated" effect to the wing, which has not been noted in the author's original description, but is clearly present in the types. The figures which I show have been compared with the latter.

PLEBEIUS NEURONA, Skinner. Entom. News, Jan. 1902, Vol. XIII, p. 15.

This rare and remarkable Lycaenid was first taken by W. G. Wright at Doble, an old Mining Camp in the San Bernardino Mountains. Of late years our local collectors have depended on the summit of Mt. Wilson to supply their specimens but the latter colony seems now to be exhausted. The Mt. Wilson captures were all smaller than the typical, ranging from 17 to 20 mm. My wife and I have recently found a colony of neurona in the Tehachapi Mountains, at an elevation of over 6,000 feet from which a generous series was secured. These latter captures are all larger than the Mt. Wilson specimens, ranging from 20 mm. to 28 mm. in expanse. They are otherwise typical, and show the usual wide range of variation characteristic of the species. Dr. Skinner has stated that there are no secondary sexual characters in neurona but we note one difference that seems fairly constant throughout our series of 70 specimens. In the males, an orange suffusion extends along the costal margin of primaries (upper surface) which is widest at the base and tapers toward apex. Only two females in our series show any suggestion of this.

The variation in neurona consists principally in the degree and extent of the orange "veining." This ranges from clearly marked individuals in which every nervule is distinctly lined with orange, to specimens in which there is no orange whatsoever on the nerves and which are practically indistinguishable from acmon females.

The accompanying plate† illustrates several of the points of differentiation which we have here analyzed. In addition to showing Plebeius emigdionis, neurona, chlorina and the new variety carolyna, there is shown a cut of the male of Philotes speciosa. This rare Lycaenid has been taken in isolated points on the Mojave Desert.

---

†The original cut is not reproduced, as all of the specimens shown on it have been figured in their proper order on color plates 55 and 56.

## EUCHLOE AUSONIDES Bdv. flavidalis, var. nov.*

This is a color form of *ausonides* in which a yellow suffusion covers the upper surfaces of both primaries and secondaries. It may be described in detail as follows:

### UPPER SURFACE.

PRIMARIES. Ground color light yellow. Costae, yellow mottled lightly with dark scales. Apices marked with grey brown spots of oval form occurring in relation to the nervules and constricted at their outer and inner edges. On the upper and lower radial and third median veins these spots are continued inwardly to their junction with a broad submarginal dark band, the latter extending from costae to third median vein. A dark dash marks the outer termination of second median vein. Fringes alternately grey and yellow, the grey scales in relation to the marginal row of spots. An irregular semilunate black dash at outer edge of cell. Basal area shaded inwardly with grey scales.

SECONDARIES. Ground color yellow, of a slightly darker shade than primaries. Ends of all nervules slightly accented by grey scales, the color continuing out to the fringes. Basal area heavily shaded with grey. The entire surface of the secondary has a slightly transparent effect allowing the green mottlings of the under surface to show through as delicate shadings.

### UNDER SURFACE.

PRIMARIES. Ground color yellowish white, except at apices which are pure white. Costae and outer extent of all nervules dark yellow. A concentration of this dark yellow color occurs in the region of the submarginal dark band (of upper surface) dark dash at outer edge of cell nearly as marked as on upper surface.

SECONDARIES. Ground color yellowish white, venules dark yellow. Irregular blotching and mottling of wing with olive green as in other closely related forms, but somewhat heavier than in typical ausonides. Antennae dark grey tipped with yellow. Thorax and abdomen, grey, covered with long white pile. Legs, yellow.

---

*"Bulletin So. Calif. Academy of Sciences," Vol. XXIII, Part 2, 1924.

Type. One ♀ collected by E. J. Newcomer at Palo Alto, California, May 23, 1905, in the collection of the author, Southwest Museum. So far as I know this form occurs only in the female.

### EUCHLOE AUSONIDES. Bdv. Semiflava, var. nov.

This form is marked practically as the above except that the upper surface of the secondaries alone shows the yellow suffusion, and the greenish mottling on the under side of secondaries is less extensive.

Type. One ♀ San Jose Mission, California, April, 1919. Collection of the author, Southwest Museum.

It is justifiable, in our estimation, to name these forms in view of the fact that they show a tendency within the genus toward a dimorphism of the females. An illustration of the types of above two color forms will be published in our forthcoming plate X, Butterflies of California.

### ANTHOCHARIS REAKIRTI Edw. Wrighti aberr. nov.

This remarkable aberration of reakirti probably represents a case of melanism, in which the dark markings of reakirti are carried to the ultimate degree. It was submitted by our friend, W. S. Wright, of San Diego, for whom it is named.

#### UPPER SURFACE.

Primaries. Ground color white, heavily shaded with black in the basal area and along the costae. All of the outer half of the wing from a line drawn diagonally across the outer edge of cell to inner angle is black, with the exception of a few orange-red scales, centrally placed in the black area.

Secondaries. Ground color white, profusely sprinkled with black scales. Basal area heavily shaded with black. Venules heavily and widely margined with black in the limbal area, giving the wing a striated appearance. This black banding is extended onto the fringes.

UNDER SIDE.

PRIMARIES. Costae finely mottled with black, more heavily concentrated in the apical region. Cell, basal and discal area white, venules beyond the outer edge of cell heavily margined with grey leaving only minute striations of yellow in the interspaces. The orange colored area of typical reakirti has practically disappeared except for a minute line in the radial interspaces. The outer portion of the apex has a greenish appearance, due to the admixture of the yellow and grey scales.

SECONDARIES. Much as in *reakirti* except for a heavier concentration of the mottled areas.

Body and antennae as in typical *reakirti.*

The type is figured on plate XI, figure 16, of our series, "Butterflies of California," to be subsequently published. It was taken by S. W. Monroe, at Chula Vista, California, March 7, 1919.

## A NEW MELITAEA FROM OREGON*

Collecting in the vicinity of Crater Lake, Oregon, in the late summer of 1923 was productive of a generous list of diurnals, one of which proves to be a new species.

MELITAEA BRIDGEI, sp. nov.

MALE. SUPERIOR SURFACE.

PRIMARIES. Ground color, brownish-black, fringes black interspersed with a few yellowish scales; a narrow orange brown or ferruginous marginal line, interrupted at nervules; internal to this a series of six to eight lunate or irregular spots, the largest being placed between the second and third median nervule; internal to this a sinuous row of six to eight quadrate or irregular spots a shade lighter in color than the previous two rows. Internal to this is a fourth row of still lighter quadrate spots, seven in number; those in the radial interspaces tending to fuse with equivalent spots of the third row. This row is formed in a sinuous line, the upper portion strongly concave medially. Two small orange-brown spots are placed lateral to the discocellulars. Two elongate spots occur in the lateral portion of cell, the medial one being lighter in color. Three or four small irregular spots occur in the basal portion of cell and one or two round or irregular spots are placed just below the cell.

---

*"Bulletin So. Calif. Academy of Sciences," Vol. XXIII, Part 6, 1924.

Secondaries. Ground color and series of spots of same shade as corresponding rows in primaries. Fringes, creamy-yellow, interrupted with black at ends of nervules; marginal row of six or seven narrow elongate spots; submarginal row of lunate or irregular spots, largest in second and third median interspaces; internal to this a row of five or six irregular spots. A fourth row of seven or eight quadrate or irregular spots in the limbal area, concave medially. Basal area completely brownish-black except for two spots in outer portion of cell, the lateral of which is lunate, while the medial is a mere point of a lighter color.

Male. Inferior surface.

Primaries. A submarginal line corresponds to the same line on superior surface, but is more clearly defined, and interrupted at nervules by narrow black lines; internal to this a row of eight lunate, yellowish spots, shaded internally by a wide black band. The third and fourth rows of spots have fused so as to form a continuous band covering most of the limbal area, with fine black streaks on the nervules, dividing it into elongate quadrate spots. The ground color of this band is orange-brown, but medially it shades to a creamy-buff. Medial to this are numerous irregular spots on a black ground. The cell is orange brown, except for a band of creamy-buff crossing the outer third, and edged with black, and an irregular spot in the inner third, similarly colored and edged.

Secondaries. Narrow submarginal line as on primaries, with similar interruptions at nervules; internal to this seven lunate spots of a clear creamy-yellow, the largest placed between the second and third median nervule. Internal to this a black irregular line medial to which is a row of seven quadrate or irregular spots, the two nearest costa, creamy-yellow, the remainder orange-brown; internal to this a broad band of irregularly quadrate creamy-yellow spots separated by the black lines of the nervules, and also crossed transversely by two sinuous black lines, one laterally, the other medially placed. Basal area orange-brown with from four to six irregular creamy-yellow spots, bordered with black.

Head, thorax and abdomen; black above, creamy-yellow below.

Antennae; black, finely annulated with yellow, club tipped with yellow-buff.

Expanse. Male 1⅜ in. (35 mm.) Female 1½ in. (39 mm.)

The female differs from the male principally in the fact that the series of lighter colored spots are more pronounced and of a lighter shade.

Types: Holotype, male. Crater Lake, Oregon, August 2, 1923.
Allotype, female. Crater Lake, Oregon, August 2, 1923.
Paratypes Nos. 1 to 11, all taken at Crater Lake, Oregon, August 2, 1923. Ten males. One female.

The holotype, allotype, and eight paratypes, in the collection of the Southwest Museum, Los Angeles, California.

Paratype No. 9, deposited with Dr. Wm. Barnes, Decatur, Illinois.

Paratype No. 10, deposited with the National Museum.

Paratype No. 11, deposited with the Canadian National Collection, Dr. McDunnough, Ottawa, Ontario, Canada. The holotype, allotype and paratype No. 1 to be subsequently shown in colors on plate No. 38.*

This species is intermediate between whitneyi Behr. and hoffmanni Behr. It is darker than either species. From hoffmanni it may be distinguished by the fact that the lighter yellowish band of spots in the limbal area, superior surface, is only half the width of hoffmanni. This band, in the last named species tends to fuse with the third band throughout almost its entire length. The colors are very close in both these species, whereas in whitneyi, they are of a more ruddy hue.

I take pleasure in naming this species for Dr. Norman Bridge, whose interest in and support of science receives all too little recognition in proportion to the good works for which he and Mrs. Bridge are responsible. This, I make bold to do without asking his permission.

(NOTE. Paratypes of *Melitaea hoffmanni segregata* B. & McD. have been examined through the courtesy of Drs. Barnes and Benjamin. They are the same as *bridgei* and the latter therefore falls as a synonym.—J. C.)

---

*These are now figured as Nos. 9, 10 and 11 on Plate 37.

# A NEW VARIETY AND TWO NEW ABERRANT FORMS OF CALIFORNIA BUTTERFLIES*

EURYMUS BEHRI Edw. form *canescens.* var. nov.

Most of the collectors and students of West American Butterflies have long been familiar with the fact that the female of Eurymus behri Edw. occurs in two forms, a yellow and a white. This follows a rule occurring in many members of the genus, in which albinism of this sex is common. The albinic females of our more common sulphurs have received names, but the white female of E. behri has thus far escaped a designation.

I propose for this form the name *canescens* and fix as the type the specimen shown on plate XVI, figure 4 of my forthcoming "Butterflies of California." This plate will be subsequently shown in the "Bulletin."

The form differs in no particular from typical E. behri ♀ except that the ground color is white instead of yellow or greenish-yellow as in the typical examples.

Type, Tioga Pass, Yosemite, Calif., Aug. 4, 1922.

Six paratypes. Same place and date. In the collection of the Southwest Mueum.

DANAUS BERENICE aberration *kerri,* aber. nov.

An interesting aberrant example has come to us through the courtesy of Mr. Laurance T. Kerr, of Orange, Cal., which I take pleasure in naming after him. It is a male, somewhat dwarfed but normally formed and differs from D. berenice in the fact that all of the white spots occurring in both the primaries and secondaries of the typical insect are totally suppressed on both upper and under surfaces of the wings. A colored reproduction of the type will be shown on Plate XVII, figure 6, thus rendering a detailed description unnecessary.

TYPE. ♂ Taken at Blythe, Calif., Oct. 28, 1921, in the collection of the Southwest Museum.

---

*"Bulletin, So. Calif. Academy of Sciences," Vol. XXIV, No. 1, Jan., 1925.

ARGYNNIS APACHEANA, Skinner. *aberration hermosa,* aber, nov.

A remarkable aberration of this beautiful fritillary was captured by the writer in Inyo County, California, along with numerous examples of the typical insect.

This unique specimen is a male, and may be described as follows:

Ground color, and all markings as in typical male APACHEANA, except as follows:

PRIMARIES. SUPERIOR SURFACE.

The submarginal row of sagittal spots slightly heavier and tending to join the marginal line. The basal and discal portions solid black, except for three brown spots as follows: one oblongate bar across the center of cell, one small triangular spot beyond outer edge of cell; one oval spot below first median nervule. A very slight brown powdering suffuses the inner portion of basal area.

SECONDARIES, SUPERIOR SURFACE.

No variation from the normal maculation of the species.

INFERIOR SURFACE, PRIMARIES AND SECONDARIES.

The butterfly does not differ on the under surface, from the normal markings.

Expanse: Two and five-eighths inches (67 mm.).

TYPE: One male, Round Valley, Inyo County, California, July 30, 1922. In the collection of the author, Southwest Museum, Los Angeles.

I venture to describe this interesting aberration because of its suggestive approach toward the eastern *A. diana.* It is possible that we may have here a hint as to the phylogenetic affinities of the species. This will be subsequently illustrated in colors on plate 23 in our forthcoming "Butterflies of California," figure 4.

## A NEW RACE OF MITOURA SIVA EDW. IN CALIFORNIA*

A number of years ago I took a small series of greenish *Mitoura* in the juniper belt on the northeastern slope of the Sierra Madre Mountains, in Mint Canyon, which I thought at the time were *M. loki* Skinner. A few of these were sent to Dr. Skinner who wrote me that they were not his species, but were probably close to *siva*. I have recently received, through the kindness of Drs. Barnes and Benjamin, a series of *M. siva* from Arizona. An examination of these convinces me that the Mint Canyon form is a connecting link between *siva* and *loki*. My opinion is further borne out by Dr. Benjamin to whom I have submitted specimens. I therefore propose for this form the name,

---

*"Bulletin So. Calif. Academy of Sciences," Vol. XXIV, No. 2, May, 1925.

Mitoura siva Edw. form *juniperaria* form nov.

Expanse: ♂ 15/16 inches; ♀ 1 inch.

♂ Superior surface, primaries: Ground color wood-brown, flushed in the center of the wing with a lighter, more lustrous shade of brown very much as in *siva*.

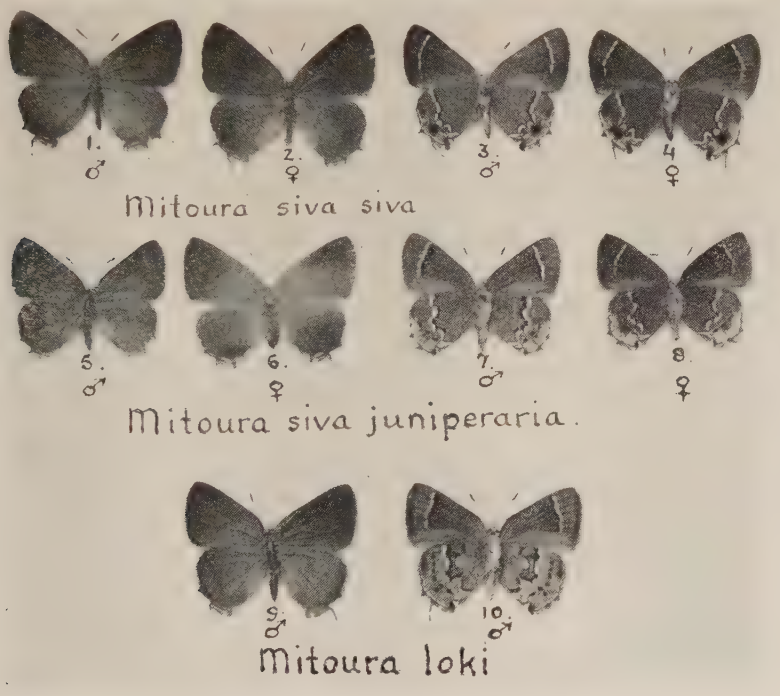
Secondaries similarly colored, and practically the same as *siva* except that both the tails average only 2/3 the length of the last named species.

Inferior surface, primaries: Ground color light brown powdered with green in basal area and at apex. An extra-median interrupted white band crosses the wing but is obsolescent in the posterior one-third. This is shaded internally with a darker brown line. In all of these particulars it does not differ from *siva*.

The characteristic markings are confined to the *secondaries*, which are predominantly of a green color. A fine black marginal line occurs as in *siva*. Internal to this is a bluish field (actually composed of a mixture of black and white scales) which is widest near anal angle, and tapers out as it approaches the costal angle. This blue field is much more pronounced than in *siva*. A minute black ocellus occurs in this field at a point where it would form a right angle triangle with lines extended to the base of the tails. This point is about one-fourth the area of the equivalent ocellus in *siva*. Internal thereto are a few orange scales, but not an orange lunule as in the species with which we are comparing it.

Internal to the blue field is an area of green which is widest at the costal angle and tapers toward anal angle. This field is restricted in *siva* and does not extend posterior to the aforementioned ocellus, whereas in our species it extends nearly to the anal angle. Between the blue and green fields are a series of black ovate spots, the largest of which is anterior to the submedian vein. These are typically four in number. A prominent recurved white band crosses the median area. This begins, in our species, at a point about half way between the costal angle and base, whereas in *siva* it originates about 1/3 internal to the costal angle; also it curves sharply inward toward the disc in our species, whereas in *siva* it follows a fairly straight course posteriorly. One fairly constant feature of *siva* is the W mark in this line lateral to the disc. This is not prominent in *juniperaria*, and ceases altogether in *loki*, as a reference to our plate will show. The basal area in our species is usually a clear field of green, but about one out of every four show a slight suggestion of the extra-basal line which is so prominent a feature of *loki*. In all other respects our species resembles *siva*.

♀ much like ♂ except for the greater amount of the light lustrous brown on superior surface of wings.



(Plate 2 of the Original Publication)

TYPES. Described from 37 males, 25 females, all taken at Mint Canyon, Sierra Madre Mts., Cal. Fifty-three spec. April 14th to 30th, 1923. Nine spec. May 5 to 8, 1925.

This is the species that Mr. Karl Coolidge dealt with in his description of the early stages of *Thecla loki* in Entomol. News, Vol. 35, No. 6, 1924. Undoubtedly the preliminary stages of all members of the group including *castulis* and *loki* are very similar.

## EIGHT NEW RACES, FORMS OR ABERRATIONS OF CALIFORNIA BUTTERFLIES*

Drs. Barnes and McDunnough, in their CONTRIBUTIONS, Vol. 3, No. 2, have pointed out the advisability of holding the name *eryngii* for the race of *Coenonympha california,* without ocelli, occurring in the vicinity of Soda Springs, Siskiyou County, California. They have not, however, mentioned the fact that this race is seasonally dimorphic as with *C. california* and *galactinus.*

Henry Edwards' original description of *eryngii* strongly indicates that he is dealing with the summer form—which is "wanting the black or dusky hairs at the base of the wings, the thorax and abdomen being concolorous." His comparison of the type with *galactinus,* in which the absence of this black powdering in the basal area is a constant feature, further strengthens this opinion. His types were collected in August when the yellow form is predominant.

We are safe in presuming therefore that *eryngii* refers to the late form, which leaves the white spring and early summer form without a designation. We propose for this the name *siskiyouensis,* and record it as follows:

COENONYMPHA CALIFORNIA form SISKIYOUENSIS, form nov.

Expanse, ♂ 1⅛ inches. ♀ same.

♂ SUPERIOR SURFACE, primaries and secondaries, lustrous white, even on the fringes, (which in typical *california* are usually darker than the remainder of the wing). A slight greyish powdering is noted on the basal area of the primaries, but is less noticeable on secondaries.

---

*"Bulletin So. Calif. Academy of Sciences," Vol. XXIV, Part 3, Sept., 1925.

Inferior surface. Resembles typical *california*, the ground color being white with a liberal maculation of brownish grey. There is, however, a complete suppression of all ocelli. (One specimen shows a slight hint of one or two points, as white dots, but not the true ocellus with dark centers.) The dark band crossing the outer third of the primary is slightly more crenated than in the typical form.

♀ much the same as ♂

It must be noted that these forms emerge at a relatively later period than is the case in the lowlands.

In other respects this form does not differ from typical *california*.

Types. ♂ holotype, Mt. Shasta, Calif., July 19, 1921. ♀ allotype, Shasta Retreat, Siskiyou County, Calif., June 1-7. Coll. Barnes. Paratypes Nos. 1 and 2, Siskiyou Co., Calif., July 28, 1923. Nos. 3, 4 and 5, Shasta Retreat, Siskiyou Co., Calif., June 8-15. Coll. Barnes. The holotype and paratypes 1 and 2 in the collection of the Southwest Museum. Allotype and paratypes 3 to 5 in the collection of Dr. William Barnes.

Our color plate 18, figure 11 shows the superior surface of our ♂ holotype, and fig. 12, paratype No. 2.

In CONTRIBUTIONS, Vol. 3, No. 2, Drs. Barnes and McDunnough state that the type series of *Argynnis purpurascens* Hy. Edw. in the American Museum contains a ♂ of a form of *hydaspe* and ♀ ♀ of *zerene*, and they have appropriately restricted the type to the dark male from Soda Springs, Siskiyou County, California.

Both *hydaspe* and *zerene* show these dark northern forms. It seems to us inconsistent to apply the name *purpurascens* to forms of two different species within a genus, and we therefore propose to designate the purplish form of *zerene* as:

Argynnis zerene form conchyliatus form nov. naming it for the purple shell from which royal purple dyes were made in the days of the Roman Empire.

Our figures 1 and 2 on color plate 25 give such accurate delineation of the under side of both sexes of this form, that a lengthy description is unnecessary. It is sufficient to state that the superior surface in both sexes is somewhat heavier marked than in the typical examples, and the inferior surfaces are more deeply overlaid with rich brown, in which a purplish sheen is detected. This purplish color is more marked in the female.

The buff band internal to submarginal silver lunules on inferior surface is markedly restricted. Both sexes are well silvered. Our figure 1 shows the under surface of ♂ holotype, and figure 2 the same aspect of ♀ allotype.

TYPES. ♂ holotype, Mt. Shasta, Calif., July 19, 1921. ♀ allotype, Northern California, no date, collected by Cottle. Paratypes Nos. 1 to 4, ♂ ♂ Shasta Co., Calif., June 4th to July 10th. Nos. 5 to 8, Shasta Retreat, Siskiyou Co., Calif., June 16 to July 15, Coll. Barnes. Paratypes Nos. 9 to 12, ♀ ♀ Shasta and Humboldt Counties, Calif., July 5 to August 11, 1923. Nos. 13 to 16, Shasta Retreat, Siskiyou Co., Calif., July 1 to August 23. Coll. Barnes.

Holotype, allotype and paratypes Nos. 1 to 4 and 9 to 12 in the Southwest Museum Collection. Paratypes Nos. 5 to 8 and 13 to 16, in the collection of Dr. William Barnes, Decatur, Ill.

Dr. Oberthur's publication of Boisduval's types of *Argynnis hydaspe* (Etudes de Lepidopterologie Comparee, Fasc. IX, Part 2), convinces us that these were collected in the Sierran foothills at some point about midway of the species range within the state.

This species shows a tendency toward intensification of the dark colors and a widening of the black bands, in the northern limits of its range, the extreme of which finds expression in the form *rhodope.*

A reverse tendency is evidenced in its southern extension. We are indebted to Mr. W. H. Ireland for a series of specimens from the Greenhorn Mountains, which are the southernmost limit of its range.

These carry the "lightening" to an extreme point, and give us a form which is worthy of special designation. For this form we propose the name:

ARGYNNIS HYDASPE form VIRIDICORNIS form nov.

Expanse, ♂ 2 1/16 inches. ♀ 2¼ inches.

♂ SUPERIOR SURFACE, much as in typical *hydaspe* but the dark markings are reduced in intensity. Two fine marginal lines are apparent on primaries, which in the typical form tend to fuse as a wide marginal band. Internal to this is a row of seven lunules. In the typical form these are usually fused, thus enclosing 6 ovals, a feature that is particularly noticeable in Oberthur's type figure 2200. Internal to this row of lunules is the usual row of six round spots. Medial to this is the usual irregular crenated band, but in our form this is reduced in width and is less indented than in the typical examples. The bars crossing cell are also restricted in width. The medial half of primaries is more nearly uniform in ground color with the remainder of the wing than is the case with the typical form. On the secondaries the principal difference lies in the reduction in width of the irregular band crossing the middle area of the wing. This is well brought out in our figure 4, color plate 25.

INFERIOR SURFACE. This aspect of the butterfly is markedly different from the typical form, in the fact that the light buff shade is much increased, and is extended inward on the primaries to the cell, and also on the secondaries where it reaches the basal area.

The ovals and lunules (which in most of our Argynnids are silvered) are increased in area, and are of the usual creamy-buff shade.

Our figure 6 shows the under side of the holotype ♂, figure 8, the same aspect of allotype ♀, all shown on color plate 25, to be subsequently run in the "Bulletin."

TYPES. Holotype ♂ Greenhorn Mountains, Calif., July, 1923, W. H. Ireland. Allotype ♀ same locality, date, and collector. 3 paratypes, all taken at the same place, on the same date, by Mr. Ireland. Two of these will be deposited in the Barnes collection. The remainder are in the collection of the Southwest Museum.

Mr. J. E. Cottle, of San Francisco, has loaned us an Argynnid which seems so radically different from any other member of the genus occurring in our state that I venture to describe it, notwithstanding the fact that at present it is a unique example.

ARGYNNIS COTTLEI sp. nov.

♀ SUPERIOR SURFACE, primaries. Color and general markings somewhat as in *hippolyta,* but the dark spots and bands are relatively heavier. Fringes cream, except at ends of nervules where they are dark. The marginal lines, which in our examples of *hippolyta* are double, show in this specimen as a wide single band. Internal to this the usual row of 8 oval spots, creamy-buff in color, shaded with black lunules on their inner edges. Internal to this the usual buff field, with 6 round dark spots superimposed on it. The usual dark crenated line internal to this field is heavier than in *hippolyta,* as are also the dark bands crossing the cell. The basal area is an even dark ferruginous.

Secondaries. Fringes as on primaries. Marginal lines fused near costa but separating into two narrow lines, which are clearly defined in the posterior portion of wing. Internal to this the usual row of 7 oval spots, lighter in shade than the ground color, and relatively larger than on other species. These are shaded internally by the usual dark lunules. Internal to this a wide band of creamy-buff, darker in shade on its outer half, and crossed by the usual row of small round spots. Internal to this a wide crenated dark band. A heavy O in outer portion of cell. Basal area, dark ferruginous.

INFERIOR SURFACE. Somewhat resembling *irene.* All of the oval spots large, and entirely without a trace of silver scaling. The usual crenated line across the center of primaries is wide and clearly defined. On the secondaries, the usual row of submarginal spots is distinctive, being formed of large ovals without a trace of the triangular effect common to most of our Argynnids. The buff band internal to these is narrow. The oval spots of the discal area are large, and are shaded internally by narrow black lines as in *irene.* Further description is unnecessary in view of the colored representation of this aspect of the species shown on our color plate 26, figure 2.

Thorax and abdomen, brown above, cream below.

Expanse. $1\frac{7}{8}$ inches.

TYPE. ♀ near Alturas, Modoc Co., Calif. No date given. In the collection of Mr. J. E. Cottle, San Francisco.

This butterfly may prove to be an unsilvered aberrant form of *hippolyta* but it seems so distinct in many particulars that I list it for the present as a separate species.

The handsome aberration of *Argynnis zerene* which I have shown on color plate 26, figure 1, is so unique that I have ventured to name it for the noble mountain on which it was found. This region has, for some unknown reason, a profound effect on certain insects occurring in it. This is well illustrated in the case of *Pseudohazis eglanterina.* This beautiful moth is subject to some variations throughout its range, but in no other region have I seen such a marked tendency to aberrations as on Mt. Shasta. The majority of the specimens are heavily suffused (form *shastaensis* Behr) but examples occur which are of nearly a clear yellow. I have designated this specimen:—

ARGYNNIS ZERENE ab. SHASTAENSIS aberr. nov.

Expanse. 2⅛ inches.

♂ SUPERIOR SURFACE, primaries. Ground color a rich black. Fringes black opposite nervules, with narrow buff areas between. Marginal lines double but fused at nervules, enclosing 6 narrow elongate lines. Several irregular buff spots are scattered over the basal and discal areas. These are so clearly shown on our plate that no description is necessary.

Secondaries. Fringes, and marginal bands as on primaries. Internal thereto are six oval or irregular buff spots, largest at anal end. Remainder of wing nearly a solid black, except along inner margin where it is buff.

INFERIOR SURFACE, primaries. Fringes, blackish-brown, except for a narrow buff area between each nervule. Suggestion of a double marginal brown band with buff shading in the inter-nervular area. Internal to this are 6 triangular or irregular creamy-buff spots on a dark brown background, the largest near apex, and the posterior paired. The fourth and fifth of these are shaded internally by elongate sagittate spots. The usual crenated black line crossing the middle of wing is so wide as to obscure most of this area. The cell is nearly filled in its outer two-thirds by black scales, and a narrow black line crosses the inner third, which is of a buff color.

Secondaries. No trace of silvering occurs, and the spots which usually bear this lustrous scaling are reduced in number and area. Fringes and marginal lines as on primaries. Seven oval or irregular submarginal cream colored spots, the first and last being mere points. Internal to this there is almost no trace of the usual buff area, but instead of this there is a rich, chocolate brown ground color. This becomes darker in the discal area and gradually shades to a light brown in the basal area. In the outer portion of the discal area, the usual 7 spots are reduced in area, and only five are defined with any degree of clarity. In the extra-basal area there are three spots, the center one being largest. These are margined or internally shaded with black. Three irregular dashes of light buff occur in the inner basal area, the central one being about three times the area of the others.

Thorax and abdomen, dark brown above, creamy-buff below.

TYPE. ♂ Mt. Shasta, Siskiyou Co., July.

Collection. J. E. Cottle.

Another remarkable aberration secured by Mr. Cottle is worthy of separate designation and I propose for it the following name:

ARGYNNIS HYDASPE ab. CALIGINOSA aberr. nov.

Expanse. 2⅝ inches.

♂ SUPERIOR SURFACE, primaries. Ground color a rich black. Fringes black with a few brown scales between nervules. Wide black marginal band, with a few dark brown scales between nervules. Six small round submarginal ferruginous spots on a black ground, and a slight powdering of brown scales along costa near apex and base. Six black, round spots in a row across limbal area, narrowly and irregularly margined with ferruginous, giving the appearance of ocelli. Discal area almost completely suffused with black, except for two quadrate light ferruginous spots at end of disc, and a powdering of lighter scales below the first submedian nervule. All of the nervules have a slight suggestion of lighter scaling through the discal area. Outer half of cell black, an elongate irregular spot centrally placed and narrowly edged with black on its inner margin. Basal area dark ferruginous.

Secondaries. Fringes as on primaries, but with a larger number of light scales. Double marginal black line fused at nervules. Seven submarginal ovals, those nearest costa more clearly defined, and the anal three reduced almost to narrow lines. Five or six round black spots across limbal area, partly surrounded by ferruginous, and tending to fuse at several points with the black submarginal lunules. Discal area solid black except for two poorly defined ferruginous spots centrally placed. Basal area darker than on primaries.

This aspect of the butterfly is clearly depicted in our figure 3 of plate 26.

INFERIOR SURFACE, primaries. Two narrow marginal black lines fused at nervules, and enclosing 7 elongate brown dashes. Internal thereto 6 buff triangles, the anterior being more clearly defined. There is a large amount of brown scaling throughout the apical area, and the light spots of the upper surface carry through with a slight increase of area. Otherwise the markings are much as on the superior surface, although the black is not of quite so deep a shade.

Secondaries. The submarginal stripes are lost, being replaced by a wide, brown band. Submarginal row of triangular spots buff, those in the radial interspaces being more clearly defined. These are margined with blackish scales and a few of them are slightly invaded with these same scales, giving a suggestion of blue. Internal to this is a clear field of rich brown bordered on its discal edge by a row of 6 or 7 buff ovals. Only the one distal to the end of the cell is well defined and large. The others are suffused to a greater or less extent by black scaling. All are margined with black, heaviest on their basal edges. Internal to this is a field of rich brown, with five buff spots super-imposed. Only the outer three of these are clearly defined, and these are margined on their basal edges with black. There are a few irregularly placed scales of buff on the brown field of the basal area. The costa are narrowly margined with black.

TYPE. ♂ Modoc Co., Calif. No date.

Collection. Mr. J. E. Cottle.

Dr. Holland in his "Butterfly Book," suggests that *Argynnis atossa* may be an extreme variation of *A. adiaste.* We are confirmed in this belief by the receipt of a small series of specimens from Mr. Victor Clemence, of Atascadero, Calif., of a form which is exactly intermediate in every respect between *atossa* and *adiaste.* We propose for this the name

ARGYNNIS ADIASTE race CLEMENCEI race nov.

Expanse. ♂ 2 inches. ♀ 2⅛ inches.

Ground color, in the ♂ a light fulvous, whereas *atossa* is a clear, yellow brown and *adiaste* a rich, dark, fulvous. ♀ a shade lighter. Our plate 28, figures 7 to 9 give such accurate delineation of this race that a detailed description is unnecessary. All of the spots and lines are disposed in a manner suggesting both *atossa* and *adiaste.* The marginal lines of primaries are double, but not heavily defined as in *adiaste;* the submarginal lunules are clearly defined, but not with the intensity of the last named species. The inferior surface, both as regards ground color, and the intensity of spots, etc., is exactly intermediate between the southern and northern races.

Holotype ♂, Atascadero, Calif., June 30, 1922. Victor L. Clemence. (Figured as No. 7.)

Allotype ♀ same date, locality and collector. (Fig. 9.)

Paratype No. 1. Same date, locality and collector. Fig. 8 under side. All figures shown on color plate 28.

I have collected in a number of localities in the coast range between Atascadero and the Tejon Mountains, and thus far have failed to secure connecting examples between these geographic races. It is possible that there remain, at the present time certain "islands" of survival of what at one time was a single species with an unbroken range throughout the coastal mountains.

The following arrangement seems justifiable for this group:

Argynnis adiaste Behr.

(a) Geog. race clemencei Comst.
(b) Geog. race atossa Edw.

Modoc County in northeastern California, is a district seldom visited by entomologists. The mountain ranges of this territory are frequently separated from neighboring ranges by wide stretches of desert or alkali flats. This would naturally tend to the production of distinct species or races of such butterflies as are characteristically alpine in habits. One such species has come to my attention, which I take pleasure in naming for my friend, Mr. Jean Gunder.

ARGYNNIS GUNDERI sp. nov.

Expanse. ♂ 1⅛ inches. ♀ 1¼ inches.

♂ SUPERIOR SURFACE, primaries. Fringes buff. Narrow submarginal line, thickened at junction with nervules. Internal to this a row of black crescents, becoming obsolete toward the apex. The usual row of 6 round spots crosses the limbal area. Fine dark scaling on the nervules gives this area a barred appearance. The usual crenated band crosses the outer part of discal area, but this is discontinuous at the nervules. An inverted capital P at outer end of cell and three wavy lines crossing its center. Olive scaling suffuses the basal area. The ground color of both wings is a clear light buff.

Secondaries. Fringes and submarginal line as on primaries. Internal to this the usual row of lunules. A row of five round spots crosses the limbal area, the center one being smallest. The crenated line of the primaries is continued on the secondaries in much the same disjointed manner. An inverted C fills the outer portion of cell. Basal area as on primaries.

Inferior surface. Both wings show a clear, yellow-buff ground color which is of a lighter shade than in any other California Argynnid except *atossa.* The spots are all richly silvered.

Primaries. Apex clear yellow buff except for the silver spots. The submarginal crescents are reduced to 3 in the posterior portion; likewise the round spots of the limbal area are reduced to 3 or 4. The crenated line crossing the outer part of the discal area is reduced to 6 well defined quadrate spots. The dark markings in the region of the cell carry through to the under side.

Secondaries. There is no trace of any black or brown shading on this wing. A very delicate olive green scaling shows in relation to some of the silver spots, particularly on the inner edges of the submarginal row. The latter are triangular in form.

All of the above points are clearly brought out in our figures 4 to 6 of color plate 27, rendering further description unnecessary.

♀ Much the same as ♂ except that the dark markings are a little heavier, the ground color slightly richer, with the areas above the silver spots showing lighter on the superior surface, a slight suffusion of orange radiating from the basal area on under surface of primaries, and a little heavier olive scaling on the under side of secondaries.

Types: Holotype ♂ Modoc Co., Cal., June 3, 1924. Allotype ♀ Modoc Co., Calif., July 7, 1924. Both coll. author. Paratype. Buck Creek, Modoc Co., July 21, 1922. Coll, Jean Gunder.

*Gunderi* may prove to be a geographic race of *snyderi,* which it somewhat resembles, but its smaller size, lighter ground color, and particularly the clear yellow-buff on under surface will serve to distinguish it.

Certain authors have treated *Argynnis atossa* as an unsilvered race of *A. semiramis.* From long acquaintance with these two species, I am convinced that *atossa* is a distinct species. It flies in a territory centering in the Tehachapi Mountains, whereas *semiramis* occurs in ranges to the south, such as the San Gabriel, San Bernardino and San Jacinto. Further confirmation of this rests in the fact that occasional specimens of *atossa* show various degrees of silvering, and these, even when fully silvered, show no resemblance to *semiramis*. I am showing, on plate 28, figure 6, one of these silvered examples, and propose for it the name

ARGYNNIS *atossa* form TEJONICA form nov.

This is typical *atossa* except for the fact that the spots on the under side of both primaries and secondaries are silvered. These lustrous spots are disposed exactly as in other silvered members of the genus. Our plate does not bring out this effect to the degree that we would wish. It is extremely difficult in a four color plate to suggest the effect of silver, since it is not a true color.

TYPE. Our example is a ♀ and was taken by Mr. Jean Gunder in the Tejon region (Collins Ranch) on August 12, 1923.

## TWELVE NEW SPECIES OR ABERRATIONS OF CALIFORNIA BUTTERFLIES*

The members of the *chalcedona* group of *Euphydryas* are subject to a wide range of variation and aberration. Most of our California collectors possess one or more of these peculiar forms, and inquiries are numerous concerning their cause and designation.

Some of these have received names, and others are in danger of being described without much thought for the direction in which the variation runs or the extent to which this variation is carried, unless some effort is made to reduce the matter to systematic order.

The direction in which this group varies is—

1. A tendency toward complete obscuring of primaries, or secondaries, or both,=complete or hemi-melanism.

---

*"Bulletin So. Calif. Academy of Sciences," Vol. XXV, Part 1, January, 1926.

2. A tendency toward accentuation or fusion of the yellow spots into elongate bands, on primaries, or secondaries, or both,= complete or hemi-fusion.

3. A tendency toward the lightening of the yellow spots, and the elimination of the red, or its reduction to a brownish shade on primaries, or secondaries, or both,=complete or hemi-albinism.

It is obvious that great confusion will arise if an attempt is made to name aberrant forms that are intermediate in the extent or degree of this variation,—in fact there is serious doubt as to the advisability of applying names to any aberrant forms whatsoever. Since, however, authorities continue to include such aberrations in their lists, its seems advisable to confine such naming within reasonable limits, and relegate to the synonymy all aberrant forms that do not carry a given tendency to its ultimate degree of expression.

In the group under consideration we have two names that are generally accepted,—i. e. *E. chalcedona* ab. *mariana* Barnes, representing complete melanism, and *E. chalcedona* ab. *fusimacula* Barnes, representing complete fusion of yellow maculations. In addition Mr. Jean Gunder has proposed two names to cover partial or complete albinism, *(hemiluteofuscus* and *omniluteofuscus.)*

In this paper we shall leave out of consideration the albinic tendency, and confine our analysis to the melanic and fused types.

The confusing element with which we have to deal here is that the tendency toward these aberrant patterns may occur in the primaries only, or be confined to the secondaries, and be in combination with the normal maculation on those wings which are not involved,—or there may be a fusion on one pair and an obscuration of the other.

We thus have a long list of possible combinations. The scheme of these possible variants is expressed in the following diagram,— and I have appended the names which I propose as new, in this formula.

| Primaries. | Secondaries. | |
|---|---|---|
| Normal | Normal | =chelcedona chalcedona Dbldy. & Hew. |
| Fused | Fused | =ab. *fusimacula* Barnes |
| Melanic | Melanic | =ab. *mariana* Barnes. |
| Fused | Normal | =ab. nov. *suprafusa.* |
| Melanic | Normal | =ab. nov. *supranigrella.* |
| Fused | Melanic | =ab. nov. *hemimelanica.* |
| Normal | Fused | =ab. nov. *fusisecunda.* |
| Normal | Melanic | =ab. (none yet observed.) |
| Melanic | Fused | =ab. (none yet observed.) |

The color plates of these new aberrations were published and distributed some time ago. They serve far better to describe the types than could a lengthy technical analysis. In order to designate type, locality, collector, and repository of type, etc., the following brief notes are appended.

Euphydryas chalcedona ab. suprafusa aberr. nov.

♀ Superior surface illustrated on Plate 32, figure 9.

Inferior surface normal except for the elongation and fusion of the yellow spots in the limbal area of primaries, which is more complete at the costo-apical end, and becomes less marked toward the posterior margin.

Holotype ♀. Los Angeles, Calif., April 10, 1924. In the collection of the Southwest Museum.

Allotype ♂. Tehachapi, Kern Co., Calif., June 27, 1922. Collection of Jean Gunder, Pasadena.

Paratype ♂. Diamond Canyon, Alameda Co., Calif., May 30, 1916. In the collection of Jean Gunder, Pasadena, Calif.

EUPHYDRYAS CHALCEDONA ab. SUPRANIGRELLA aberr. nov.

Superior surface illustrated on Plate 32, figure 8.

Inferior surface, primaries devoid of all yellow spots. The brick-red shade is complete over the entire wing except for a delicate striping of black on the nervules and a small amount of black scaling irregularly distributed over the apical area. Secondaries normal.

Holotype ♂. Mt. Wilson, Calif. June 22, 1920. In the collection of the Southwest Museum.

Allotype ♀. Camp Baldy, San Gabriel Mountains, Calif., June 23, 1919. In the collection of Jean Gunder.

EUPHYDRYAS CHALCEDONA ab. HEMIMELANICA aberr. nov.

Illustrated on Plate 32, superior surface of holotype ♂ figure 11, inferior surface of allotype ♀ figure 10.

The colored figures serve as sufficient description.

Holotype, Sulphur Mountain Springs, Ventura County, Calif., July 4, 1920. In the collection of Mr. Jean Gunder.

Allotype, Los Angeles, Calif., April 1, 1919. In the collection of Mr. Jean Gunder.

EUPHYDRYAS CHALCEDONA ab. FUSISECUNDA aberr. nov.

Superior surface illustrated on Plate 32, figure 12.

The inferior surface is characterized by a partial fusion of the two bands of yellow spots on the secondaries. Probably this fusion would be more complete in specimens showing the ideal pattern to fit into the scheme which we have outlined. The primaries are normal.

TYPE. ♀ Mt. Wilson, Calif., June 22, 1920. In the collection of the Southwest Museum.

While collecting in the Lake Tahoe region, where *Euphydryas sierra* abounds, we were fortunate in capturing a remarkable example of an aberrant form of this species which is worthy of designation. We published a figure of this some months ago, so that the detailed description seems hardly necessary at this time. It is named *umbrobasana,* and is shown as figure 5 of our color Plate 35. The distinguishing feature of the superior aspect is the heavy suffusion of the basal areas, particularly of the secondaries, with black,—and the tendency toward suffusion and extension of the yellow maculation in the limbal area.

The inferior surface is not figured, and is therefore dealt with in greater detail.

Primaries, fringes and marginal area as in the normal form. The submarginal double rows of yellow spots are blended into a single wide band, separated into oblongate spots by narrow black nervules, and becoming obsolescent toward the lower third of wing. Four blurred yellow dashes occur lateral to the cell. The black lines crossing the cell are blurred and suffused with black.

The secondaries are very striking in appearance, due to the fact that the submarginal row of yellow crescents and the extra-discal row of yellow spots have extended toward each other and fused, thus eliminating the usual interposed red and black-margined area, and forming a continuous wide yellow band extending almost across the wing. A few red scales slightly invade this at the costal and anal edges, which is all that remains of the normal central red row of spots. The nervules, however, are narrowly defined in black.

The basal area is a clear field of red, except for one small black circle at outer end of each cell, pupillated in yellow.

Holotype ♂ Lake Tahoe region, July, 1922.

This name was mentioned, after I had distributed my colored plates, by Mr. Jean Gunder (Entomological News, July, 1925, Vol. XXXVI) where he states that "*umbrobasana,* as its name indicates, is a more melanic aberration of *sierra,* and several degrees opposite to *magdelenæ.*"

We have received from Mr. Jean Gunder a number of aberrant examples of *Euphydryas colon* which were captured by our good friend, Otto Huellemann, of Wallace, Idaho, for whom I name this interesting variant.

EUPHYDRYAS COLON ab. HUELLEMANNI aberr. nov.

♂ Superior surface, ground color black. Marginal row of red spots on primaries and secondaries practically suppressed. Submarginal rows of yellow spots on primaries present but slightly blurred. Extra-discal area occupied by three long yellow dashes, which are powdered laterally by a few red scales. Basal area solid black. The double row of yellow spots normally occurring on secondaries are obsolescent except for a few minute points. The basal half of secondaries, a rich black.

Inferior surface, much as in normal *colon* except for a partial, (or in one case a complete) suppression of the yellow spots in the basal area of secondaries, and their replacement with black. There is also a tendency toward extension and blurring of the yellow maculations.

♀ much as in male, although our allotype shows some tendency toward the retention of the marginal row of red spots on the superior surface. Further description seems unnecessary in view of our publication of colored figures some months ago.

Holotype ♂ Wallace, Idaho, June 12, 1921. Illustrated on Plate 33, figure 5.

Allotype ♀ Wallace, Idaho, June 15, 1919. Illustrated on Plate 33, figure 4.

Paratype No. 1 ♂ Wallace, Idaho, June 14, 1925.

Paratype No. 2 ♀ Wallace, Idaho, July 4, 1925.

All collected by Mr. Otto Huellemann, and in the collection of Mr. Jean Gunder, of Pasadena, Calif.

EUPHYDRYAS RUBICUNDA ab. RUBROSUFFUSA aberr. nov.

Superior surface illustrated on plate 34, figure 15.

The inferior surface differs from the typical insect only in the partial suppression of the black lines on the secondaries. These are entirely absent in the area between the submarginal crescents and the extra discal row of yellow spots, and this area is wider than normal. It is a field of clear brick-red, except for a delicate dentate stripe of yellow running through it at about the center.

TYPE. ♀ Mammoth, Mono Co., Calif., July 28, 1921. Loaned from the collection of Mr. George Malcolm.

The females of *Melitœa palla* show a tendency toward the production of a dark form, one phase of which was named *eremita* by W. G. Wright. The example which he chose for his type does not, however, represent the extreme to which this melanism (if such it is) may be carried. On our color plate 36, figure 19, we picture an example which is probably the ultimate extent to which this "darkening" is carried. We have called this—

MELITAEA PALLA ab. STYGIANA aberr. nov.

The superior surface is so accurately pictured on our plate as to render a description superfluous. The inferior surface shows little variation from that of usual maculation of *eremita*, and our figure 18 on this same plate may serve to illustrate this.

TYPE. ♀ Willow Ranch, Modoc County, Calif., June 9, 1924.

Paratype No. 1. ♀ Fairfax, Marin Co., Calif., June 30, 1918.

Paratype No. 2. ♀ Carrville, Trinity Co., Calif., June 13, 1913.

Paratype No. 3. ♀ Walker, Siskiyou Co., Calif., June 3, 1920.

Paratypes Nos. 4 to 7. ♀ ♀ Willow Ranch, Modoc Co., Calif., May 30 to June 8, 1924.

Type and paratypes in the collection of Mr. Jean Gunder, Pasadena, Calif.

A remarkable aberration of *Melitœa gabbii* is illustrated on Plate 36, figure 6, which demonstrates the same tendency in this species that we have noted in the case of *palla* with its dimorphic females *eremita* and *stygiana*. We propose for this the name—

MELITAEA GABBII ab. GUNDERI aberr. nov.

The illustration pictures accurately the superior surface of this butterfly. It will be noted that it compares to *stygiana* in the *palla* series, although it is probably of much rarer occurrence.

On the inferior surface we have the usual lustrous white spots, with the remaining portions of the wing heavily suffused with black scales. These have entirely replaced the normal orange-yellow areas and spots of the secondaries, and on the primaries have caused a darkening of the entire wing and a blurring, but not an entire eradication of the maculations.

TYPE. ♀ San Fernando, Calif., April 6, 1919. In the collection of the Southwest Museum.*

Named for Mr. Jean Gunder.

MELITAEA GABBII ab. NEWCOMBI aberr. nov.

Superior surface accurately pictured on our Plate 36, figure 5. This corresponds to *eremita* in the *palla* series.

The inferior surface is practically that of normal *gabbii* except that there is a tendency toward an increase of the black scales and their invasion of the orange areas. This is more marked on the primaries.

TYPE. ♀ Pasadena, Calif., April 7, 1917. In the collection of the Southwest Museum. Named for our friend, Mr. Hal Newcomb.

MELITAEA MALCOLMI sp. nov.

This is illustrated on our color plate 36, figures 10, 11 and 12, with sufficient accuracy to render a lengthy description unnecessary. It will be noted that it differs from *gabbii* in having a uniform ground color of a duller shade, with a heavier powdering of black in the basal area. The ground color of the female is of a considerably lighter shade than the male. On the inferior surface, the lustrous spots of secondaries are less pearly than those of *gabbii* but more so than in *palla*.

Holotype ♂ (Figure 10 of Plate 36.) Near Mammoth Camp, Mono County, Calif., July 27, 1921.

Allotype ♀ (Figure 12 of Plate 36.) Same locality and date.

Paratype No. 1. ♂ (Figure 11 of Plate 36.) Same locality and date.

All collected by Mr. George Malcolm, for whom I take pleasure in naming the species.

This is very close to *Melitœa flavula* B. & McD. and may prove to be a local race of this species.

Our color plate 37, figure 13, depicts an interesting aberrant of *Melitœa chara* which we have called—

MELITAEA CHARA ab. NITELA aberr. nov., which is characterized by a lustrous white ground color on the under side of secondaries, crossed in the limbal area by a band of connected quadrate yellow spots, with fine black margins. Four small squares also occur in the basal area, two of which are in relation to the cell,—and a few irregular yellow spots are grouped close to the basal junction of the wing.

---

*(Note—The designation of female for this type is found, after more careful examination, to be an error. The specimen is a male.)

The under side of primaries is more uniformly yellow than in typical specimens, on account of the suppression of most of the black lines.

The superior surface differs from typical *chara* in the reduction of black lines throughout the discal area of both pairs of wings, and a lessened amount of black scaling throughout, which gives the suggestion of a lighter form.

TYPE. ♂ Near Palm Springs, Coachella Valley, Calif., April 5, 1921. In the collection of the Southwest Museum.

THARSALEA AROTA r. NUBILA race nov.

♂ SUPERIOR SURFACE; primaries: differs from typical *arota* in the darker shading, which is of a brownish coppery hue with no suggestion of the violet over-tint characteristic of both *arota* and *virginiensis*, and in the greater width and clearer definition of the dark margin.

Secondaries of the same shade and with equally wide dark margins, which are continued along the costal edge and into the basal area. The tails average slightly shorter, and there is an almost complete eradication of the orange stripe and submarginal lunules in this area, except for a slight suggestion on the tail itself.

Fringes brown, except toward the anal angle where they become gray to whitish.

INFERIOR SURFACE; practically as in typical *arota* except for the almost complete suppression of the red line in center of tail and the red submarginal lunules connecting with it, which are a constant feature of both *arota* and *virginiensis*.

♀ SUPERIOR SURFACE; primaries; much darker than in the typical insect, and with a reduction of the orange maculations to about half the area of the corresponding markings in *arota*. There are no orange scalings near the posterior angle of wing, which makes the wide dark marginal area (nearly $\frac{1}{8}$ inch in width) continuous from apex to posterior angle. No orange scaling occurs posterior to the submedian vein.

Secondaries; clear dark brown, except for four or five narrow orange lunules, beginning at the anal angle,—a line of orange extended onto the tail, and three small orange patches lateral and inferior to the cell.

INFERIOR SURFACE; much as in male, except for a slight suffusion of orange medial to the submarginal white lunules of primaries, shading to yellow in the limbal area.

Thorax and abdomen as in *arota.*

We have examined *arota* from central and northern California and compared Oberthur's figure of the type. A series of *virginiensis* from Virginia City, Nevada, have also been used in this comparison. *Nubila* shows much greater divergence from the typical insect than does *virginiensis.*

TYPES. Holotype ♂ Griffith Park, Los Angeles, California, July 2, 1922. Allotype ♀ same locality and date. The holotype and allotype figured on our Plate 51, figures 2 and 3. Paratypes, 21 ♂ ♂ 20 ♀ ♀ all from the above locality, June 7 to July 15, 1922. In the collection of the Southwest Museum. Paratypes will be placed in the Barnes collection, in the National Museum, and in the Canadian National collection at Ottawa, and in the collection of Jean Gunder, Pasadena.

We take this to be a dark southern race of *arota,* but it is more deserving of rank as a distinct species than is *virginiensis.*

## A NEW ABERRANT BUTTERFLY FROM SOUTHERN CALIFORNIA*

In our species of *Glaucopsyche lygdamus behrii,* southern race *australis,* we find three specimens in which the line of spots on the secondaries has entirely disappeared. For this aberration we propose the name—

GLAUCOPSYCHE LYGDAMUS BEHRII

race AUSTRALIS, ab. SINEPUNCTATA aberr. nov.

This corresponds, on the superior surface, to Grinnell's type of *australis* (comparison having been made with the type specimen which has been kindly loaned to us by Mr. Jean Gunder, for illustrating on our color plate 56.) The principal difference lies in the complete obliteration of the line of spots crossing the inner part of the limbal area on under side of secondaries, and also the entire absence of spots in the basal area. The wing is therefore immaculate except for a slight suggestion of a white line or dash near the outer edge of cell. There is a slight reduction of the spots crossing the under side of primaries.

---

*"Bulletin So. Calif. Academy of Sciences," Vol. XXV, No. 2, May, 1926.

The type is figured on our plate 56, to be subsequently published.

Type ♂ Mint Canyon, Los Angeles County, Calif., May 1, 1921.

Paratype No. 1. ♂ Same locality, April, 1920.

Paratype No. 2. ♂ Same locality and date.

Type and paratype No. 2, in the collection of the Southwest Museum.

Paratype No. 1 to be deposited in the Barnes collection, Decatur, Illinois.

# INDEX

# INDEX

## A

Aberrant Apache....81
Aberrant Augusta....103
Aberrant Ruddy Checker-spot....104
Aberrant Sierra Checker-spot....105
*abnorma, Melitæa*....112
Abnormal Checker-spot....112
Acastus Checker-spot....110
*acastus, Melitæa*....110
Acmon Blue....188
*acmon, Plebejus*....188, 276
*adenostomatis, Strymon*....162
*adiaste, Argynnis*....88

Admirals, The....143
  Arizona Admiral....145
  Burrison's Admiral....145
  Comstock's Aberrant....144
  Eave's Admiral....144
  Lorquin's Admiral....143
  Weidemeyr's Admiral....143

Aehaja Blue....185
*aehaja, Plebejus*....185
Afranius Dusky-wing....212
*afranius, Erynnis*....212

Aglais, Genus....124
  *antiopa*....126
  *californica*....124
  *grandis*....126
  *hygiaea*....126
  *milberti*....125
  *subpallida*....126

*agricola, Ochlodes*....222
*ahwashtee, Vanessa*....133
*alba, Eurymus*....51
*albanus, Papilio*....24
*albiradiata, Euphydryas*....104
Alderman Butterfly....131
*alexandra, Eurymus*....54
Alma Checker-spot....114
*alma, Melitæa*....114
*alope, Cercyonis*....70
*alpheus, Pholisora*....210
Alpheus Sooty-wing....210
*altaurus, Parnassius*....25

Amblyscirtes, Genus....225
  *phylace*....225
  *vialis*....225

*ammoni, Papilio*....23
Ammon's Swallowtail....23
*amorphæ, Zerene*....48
*ampelos, Coenonympha*....67
Ampelos Ringlet....67
*amphidusa, Eurymus*....51
*amyntula, Everes*....182
Anatomy of Butterflies....257

Angle-wings, The....121
  Colorado Angle-wing....123
  Marsyas Angle-wing....122
  Rustic Angle-wing....122
  Silenus Angle-wing....124

Anise Swallowtail....20
Anna Blue....183
*anna, Plebejus*....183
*antægon, Plebejus*....276

Anthocharis, Genus....39
  *australis*....40
  *caliente*....42
  *cethura*....41
  *deserti*....42
  *julia*....44
  *morrisoni*....41
  *reakirtii*....43
  *sara*....43
  *stella*....43
  *wrighti*....44, 282

*antiacis, Glaucopsyche*....200

Antigonus, Genus....210
  *pulverulenta*....210

*antiopa, Aglais*....126
Apache, Aberrant....81
Apache Fritillary....81
*apacheana, Argynnis*....81

Apodemia, Genus....149
  *deserti*....151
  *marginalis*....151
  *mejicanus*....151
  *mormo*....149
  *palmerii*....151
  *virgulti*....149

*aquilo, Plebejus*....184
*arachne, Melitæa*....271
Arctic Skipper....216

Arctics, The....76
  Great Arctic....76
  Ivallda Arctic....77

*archippus, Danaus*....58

ARGYNNIS, GENUS ........ 81
  *adiaste* ........ 88
  *apacheana* ........ 81
  *atossa* ........ 89
  *baroni* ........ 91
  *behrensii* ........ 83
  *bremneri* ........ 82
  *californica* ........ 87
  *caliginosa* ........ 86, 296
  *callippe* ........ 90
  *chitone* ........ 82
  *clemencei* ........ 88, 297
  *comstocki* ........ 90
  *conchyliatus* ........ 84, 291
  *coronis* ........ 91
  *cottlei* ........ 83, 293
  *erinna* ........ 95
  *gunderi* ........ 87, 298
  *hermosa* ........ 81, 287
  *hippolyta* ........ 82
  *hydaspe* ........ 84
  *inornata* ........ 92
  *irene* ........ 86
  *juba* ........ 91
  *laurina* ........ 92
  *letis* ........ 82
  *leto* ........ 81
  *macaria* ........ 92
  *malcolmi* ........ 94, 262
  *mammothi* ........ 93
  *montivaga* ........ 92
  *mormonia* ........ 95
  *nevadensis* ........ 86
  *oweni* ........ 94
  *purpurascens* ........ 85
  *rupestris* ........ 91
  *semiramis* ........ 90
  *shastaensis* ........ 84, 295
  *snyderi* ........ 87
  *tehachapina* ........ 94, 263
  *tejonica* ........ 89, 300
  *viridicornis* ........ 85, 292
  *zerene* ........ 83

*ariane, Cercyonis* ........ 71
Ariane Satyr ........ 71
Arizona Admiral ........ 145
Arizona Blue ........ 201
*arizonensis, Lycaenopsis* ........ 201
*arizonensis, Polygonus* ........ 203
*arota, Tharsalea* ........ 170
Arrangement of specimens ........ 249
Arrowhead Blue ........ 196
Artful Dusky-wing ........ 213

ASCIA ........ 29
*asterius, Papilio* ........ 19
*atalanta, Vanessa* ........ 131

ATALOPETES, GENUS ........ 224
  *campestris* ........ 224
  *huron* ........ 224

ATLIDES, GENUS ........ 154
  *halesus* ........ 154

*atossa, Argynnis* ........ 89

ATRYTONE, GENUS ........ 224
  *vestris* ........ 224

Augusta, Aberrant ........ 103
Augusta Checker-spot ........ 103
*augusta, Euphydryas* ........ 103
*augustina, Euphydryas* ........ 103
*aurantiaca, Copæodes* ........ 216
*auretorum, Strymon* ........ 161
*ausonides, Euchloe* ........ 38
*australis, Anthocharis* ........ 40
*australis, Calephelis* ........ 152
*australis, Glaucopsyche* ........ 198
*autumnalis, Eurymus* ........ 51
Avalon Hair-streak ........ 157
*avalona, Strymon* ........ 157

B

*bachmanii, Libythea* ........ 147
*bairdii, Papilio* ........ 19
Baird's Swallowtail ........ 19
Baldur Parnassian ........ 26
*baldyensis, Philotes* ........ 192
*barbara, Eurymus* ........ 52
Barbara Sulphur ........ 52
*baroni, Argynnis* ........ 91
*baroni, Cercyonis* ........ 70
*baroni, Euphydryas* ........ 100
Baron's Checker-spot ........ 100
Baron's Satyr ........ 70

# INDEX

Basilarchia, Genus..............143
*burrisonii* ....................145
*comstocki* ....................144
*eavesii* .......................144
*lorquini* ......................143
*obsoleta* ......................145
*weidemeyrii* ..................143

*battoides, Philotes*...............191
*beckerii, Pieris*.................. 29
Becker's White.................. 29
Behren's Fritillary.............. 83
*behrensii, Argynnis*.............. 83
*behrii, Callipsyche*...............169
*behrii, Cercyonis*................ 72
*behrii, Eurymus*.................. 54
*behrii, Glaucopsyche*.............197
*behrii, Parnassius*............... 27
Behr's Albinic Sulphur........... 55
Behr's Blue.....................197
Behr's Checker-spot.............102
Behr's Hair-streak..............169
Behr's Metal-mark..............149
Behr's Parnassian............... 27
Behr's Satyr.................... 72
Behr's Sulphur.................. 54
*bernardino, Philotes*.............192
*bernardino, Zerene*............... 47
*binigrimaculella, Parnassius*...... 26
Black-ribbed Pine White.......... 29

Blues, The......................177
Acmon Blue....................187
Aehaja Blue....................185
Anna Blue......................183
Arizon Blue....................201
Arrowhead Blue................196
Behr's Blue....................197
Boisduval's Blue...............185
Bright Blue....................176
Carolyn's Blue.................190
Clemence's Blue................189
Clouded Blue..................196
Coolidge's Aberrant Blue.......181
Cottle's Blue..................188
Daedalus Blue.................186
Dotted Blue....................193
Eastern Tailed Blue............181
Echo Blue......................200
Edwards' Blue..................181
Evius Blue.....................186
Eyed Blue......................200
Glaucous Blue..................192
Gray Blue......................184
Greenish Blue..................184
Gunder's Aberrant Marine Blue.178
Hilda Blue.....................185
Huguenin's Blue................200
Intermediate Blue..............193
Lotis Blue.....................183
Lupine Blue....................189
Malcolm's Aberrant Blue.......189
Maricopa Blue..................186
Marine Blue....................177
Mertila Blue...................200
Mt. Baldy Blue.................192
Orange-margined Blue..........183
Oregon Blue....................191
Pheres Blue....................186
Pigmy Blue.....................178
Polyphemus Blue...............200
Reakirt's Blue..................181
Rufescent Blue.................184
San Bernardino Blue...........192
San Emigdio Blue..............191
San Gorgonio Arrowhead Blue..197
Shasta Blue....................187
Skinner's Blue.................190
Small Blue.....................194
Sonora Blue....................194
Southern Blue..................198
Square-spotted Blue............191
Unspotted Southern Blue.......198
Varied Blue....................176
Veined Blue....................190
Western Tailed Blue...........182
White-spotted Sonora Blue......195
Xerces Blue....................199
Yosemite Blue..................187

Boisduval's Blue................185
Boisduval's Hair-streak.........154
Boisduval's Marble.............. 39
Boisduval's Satyr............... 73
Boisduval's Sulphur............. 49

*boopis, Cercyonis*................ 70
Boopis Satyr.................... 70
Bordered Patch..................119
Bramble Hair-streak.............168
Brazilian Skipper...............227
Breeding of Butterflies, Selective..138
*bremneri, Argynnis*.............. 82

Brephidium, Genus...............178
  *coolidgei* ....................181
  *exilis* .......................178

Brenthis, Genus................. 96
  *epithore* .................... 96
  *wawonæ* ...................... 96

*bridgei, Melitæa* ...............283
Bright Blue.....................176
Broad-bordered Mourning-cloak ..126
Bronzed Hair-streak.............163
*brucei, Papilio*.................. 19
Bruce's Swallowtail.............. 19
Brush-footed Butterflies......... 78

Buckeyes, The...................136
  The Buckeye...................136
  Melanic Buckeye...............138
  Schrader's Aberrant Buckeye...138

*burrisonii, Basilarchia*...........145
Burrison's Admiral..............145
Butterflies, Gross Anatomy of...257
Butterflies, Brush-footed......... 78
Butterflies, Milkweed............ 58
Butterflies, Peacock............136
Butterflies, Selective Breeding of ..138
Butterflies, Synonymic List of...230
Butterfly, Cabbage............... 35
Butterfly, Grinnell's...........135

Butterfly Migration.............127
  *Danaus menippe* in............127
  *Libythea bachmanii* in.........127
  *Vanessa californica* in.........127
  *Vanessa cardui* in.............127
  *Vanessa carye* in..............127

Butterfly, Mueller's............135

C

Cabbage Butterfly................ 35

Calephelis, Genus...............151
  *australis* ....................152
  *nemesis* ......................151

*caliente, Anthocharis*............ 42
California Dog-face ............. 46
California Fritillary ............ 87
California Hair-streak ..........159
California Patch ................120
California Ringlet ............... 65
California Sister ................145
California White ................ 30
*california, Coenympha*........... 65
*californica, Aglais*...............124
*californica, Argynnis*............ 87
*californica, Heterochroa*..........145
*californica, Strymon*.............159
*caliginosa, Argynnis*..........86, 296
*callidus, Erynnis*................213
*callippe, Argynnis*............... 90
Callippe Fritillary............... 90

Callipsyche, Genus..............169
  *behrii* ........................169
  *nigroinita* ....................169

Callophrys, Genus...............168
  *dumetorum* ...................168
  *perplexa* .....................168

*calyce, Pieris*.................... 33

Calpodes, Genus.................227
  *ethlius* .......................227

*campestris, Atalopetes*...........224
*campestris, Phyciodes*............116
*canescens, Eurymus*...........55, 286
Capture, Preparation and Preservation .......................246
*cardui, Vanessa*..................133
*carolyna, Plebejus*...........190, 278
*carolynæ, Melitæa* ..............114
Carolyn's Blue..................190
*carye, Venessa*...................134
*castoria, Pieris*.................. 34
*catalina, Phædrotes*..............197
Cataline Blue...................197

Catopsilia, Genus............... 45
  *eubule* ....................... 45
  *pallida* ...................... 46
  *sennæ* ....................... 45

*catullus, Pholisora*...............211

CERCYONIS, GENUS.................70
*alope*..........................70
*ariane*.........................71
*baroni*.........................70
*behrii*.........................72
*boopis*.........................70
*incana*.........................70
*œtus*...........................75
*paulus*.........................74
*silvestris*.....................73
*stephensi*......................71
*sthenele*.......................73
*wheeleri*.......................72
Cerrita Checker-spot.............114
*cerrita, Melitæa*...............114
*cethura, Anthocharis*...........41
Chalcedon Checker-spot...........97
*chalcedona, Euphydryas*.........97
*chalcis, Strymon*...............163
Chara Checker-spot...............112
*chara, Melitæa*.................112
CHECKER-SPOTS....................97
Aberrant Ruddy Checker-spot..104
Aberrant Sierra Checker-spot....105
Abnormal Checker-spot........112
Acastus Checker-spot.........110
Alma Checker-spot............114
Augusta Checker-spot.........103
Baron's Checker-spot.........100
Behr's Checker-spot..........102
Cerrita Checker-spot.........114
Chalcedon Checker-spot.......97
Chara Checker-spot...........112
Cloud-born Checker-spot......104
Dwinnell's Checker-spot......99
Editha Checker-spot..........101
Edwards' Checker-spot........100
Eremita Checker-spot.........109
Field's Aberrant Checker-spot..103
Fox's Aberrant Checker-spot...104
Fused Checker-spot...........98
Gabb's Checker-spot..........108
Gunder's Checker-spot........108
Half-fused Checker-spot......98
Half-melanic Checker-spot....98
Hoffmann's Checker-spot......111
Huellemann's Checker-spot....100
Infra-fused Checker-spot.....98
Leanira Checker-spot.........113
Leona Checker-spot...........113
Lustrous Checker-spot........113
Macglashan's Checker-spot....99
Mariana Checker-spot.........98
Monache Checker-spot.........115
Neumoegen's Checker-spot.....106
Newcomb's Checker-spot.......108
Northern Checker-spot........109
Obsolete Checker-spot........113
Olancha Checker-spot.........100
Pasadena Checker-spot........108
Ruddy Checker-spot...........103
San Jacinto Checker-spot.....112
Segregated Checker-spot......112
Sierra Checker-spot..........105
Stygian Checker-spot.........110
Supramelanic Checker-spot....98
Ward's Aberrant Checker-spot..110
Wheeler's Checker-spot.......106
Whitney's Checker-spot.......111
Checkered Skippers...............206
Chino Patch......................120
*chinoi, Chlosyne*...............120
*chitone, Argynnis*..............82
Chitone Fritillary...............82
*chlorina, Plebejus*.............190, 277
*chlorophora, Strymon*...........162
CHLOSYNE, GENUS..................119
*californica*....................120
*chinoi*.........................120
*crocale*........................119
*lacinia*........................119
*nigrescens*.....................120
*rufescens*......................119
*chrysalus, Hypaurotis*..........156
*chrysomelas, Eurymus*...........52
CHRYSOPHANINAE, SUBFAMILY........170
*chrysoptera, Polygonia*.........122
*cinerea, Lycænopsis*............201
*clara, Heodes*..................176
*claudia, Euptoieta*.............80
*claudianus, Parnassius*.........25
*clemencei, Argynnis*............88, 297
Clemence's Blue..................189
Clemence's Fritillary............88
*clodius Parnassius*.............25
Cloud-born Checker-spot..........104
Clouded Blue.....................196
Clouded Dog-face.................48
Cloudy Copper....................171
Cockerell's Sulphur..............51
Cockerell's Tortoise-shell.......126
*cœnia, Junonia*.................136

Coenonympha, Genus 65
  *ampelos* 67
  *california* 65
  *elko* 68
  *eryngii* 67
  *galactinus* 66
  *pulla* 67
  *siskiyouensis* 67, 290

Collecting Box 247
Collecting Paraphernalia 246
*colon, Euphydryas* 100
*coloradensis, Euchloe* 39
Colorado Angle-wing 123
Colorado Hair-streak 156
Colorado Marble 39
*columbia, Glaucopsyche* 198
*columbia, Hesperia* 217
Columbia Skipper 217
Columella Hair-streak 156
*columella, Strymon* 156
Common Hair-streak 157
Common White 31
*comstocki, Argynnis* 90
*comstocki, Basilarchia* 144
*comstocki, Dione* 79
*comstocki, Philotes* 196
*comstocki, Plebejus* 187
*comstocki, Polites* 223
Comstock's Aberrant Admiral 144
*comyntas, Everes* 181
*conchyliatus, Argynnis* 84, 291
Coolidge's Aberrant Blue 181

Copaeodes, Genus 216
  *aurantiaca* 216

Coppers, The 170
  Arota Copper 170
  Cloudy Copper 171
  Gorgon Copper 172
  Great Copper 172
  Gunder's Aberrant Copper 175
  Lustrous Copper 175
  Mourning-garbed Copper 173
  Nevada Copper 171
  Nivalis Copper 174
  Purplish Copper 174
  Reakirt's Copper 173
  Ruddy Copper 175

*coronis, Argynnis* 91
Coronis Fritillary 91
*cottlei, Argynnis* 83, 293
*cottlei, Plebejus* 188, 276
Cottle's Blue 188
Cottle's Fritillary 83
Counties, Map of 244

Crescent-spots 116
  Field Crescent 116
  Mountain Crescent 116
  Mylitta Crescent 117
  Orseis Crescent 117
  Phaon Crescent 116

*crocale, Chlosyne* 119
Crocale Patch 119
*cupreus, Heodes* 175
*curvata, Phasiana* 165
Cuyamaca Hair-streak 163
*cuyamaca, Mitoura* 163

Cynthia 131

D

Daedalus Blue 186
*daedalus, Plebejus* 186

Danaidae, Family 58

Danaus, Genus 58
  *archippus* 58
  *berenice* 60
  *fumosus* 58
  *kerri* 60, 286
  *menippe* 58
  *strigosa* 60

Dark Fritillary 86
*daunus, Papilio* 23
Daunus Swallowtail 23
*delia, Eurema* 57
Delia Sulphur 57
*demoditas, Eurema* 57
Desert Hair-streak 160
Desert Metal-mark 151
Desert Orange-tip 42
Desert Sandhill Skipper 223
*deserti, Anthocharis* 42
*deserti, Apodemia* 151
*desertorum, Strymon* 160

DIONE, GENUS.................... 78
  *comstocki* .................... 79
  *incarnata* .................... 79
  *vanillæ* ...................... 78

Dodge's Aberrant Lady..........132

DOG-FACES, THE.................. 46
  California Dog-face............ 46
  Clouded Dog-face.............. 48
  Gunder's Aberrant Dog-face..... 48
  Margined Dog-face............. 47
  Newcomb's Aberrant Dog-face... 48
  Roseate Dog-face.............. 49
  Southern Dog-face............. 48

*dorantes, Goniurus*...............205

Dotted Blue.....................193

DRYAS .......................... 81

Dryope Hair-streak..............160

*dryope, Strymon*.................160

*dumetorum, Callophrys*...........168

Dun Skipper.....................224

Dusky Metal-mark................151

Dusky Patch.....................120

DUSKY-WINGS, THE.........206, 212
  Afranius Dusky-wing...........212
  Artful Dusky-wing.............213
  Funereal Dusky-wing...........214
  Grinnell's Dusky-wing..........213
  Juvenal's Dusky-wing...........213
  Mexican Dusky-wing............206
  Mournful Dusky-wing...........214
  Nevada Dusky-wing.............206
  Propertius Dusky-wing.........214
  Wright's Dusky-wing............212

Dwarf Yellows................... 36

*dwinnelli, Euphydryas*............ 99

Dwinnell's Checker-spot.......... 99

*Dyar's Parnassian*................ 25

E

Early Stages of Butterflies.......259

Eastern Tailed Blue.............181

Eaves' Admiral..................144

*eavesii, Basilarchia*..............144

Echo Blue.......................200

*echo, Lycaenopsis*................200

Editha Checker-spot.............101

*editha, Euphydryas*..............101

*editha, Heodes*..................173

Edith's Copper..................173

Edwards' Blue ..................181

Edwards' Checker-spot ..........100

Edwards' Marble ................ 37

Edwards' Painted Lady .........131

Edwards' Sulphur ............... 54

Edwards' Swallowtail ........... 22

Edwards' White ................. 33

*edwardsi, Vanessa*...............131

*edwardsii, Eurymus*.............. 54

*eglanterina, Pseudohazis*.........294

Ehrmann's Aberrant Mourning-...
  cloak .........................126

Elfin, Western..................167

Elfin, Western Banded...........167

*elivata, Pieris*.................. 31

*elko, Coenonympha*............... 68

Elko Ringlet.................... 68

*elymi, Vanessa*..................134

*emigdionis, Plebejus*.........191, 278

*enoptes, Philotes*................193

EPARGYREUS, GENUS..............203
  *exadeus* .......................204
  *tityrus* ........................203

*epithore, Brenthis*............... 96

Eremita Checker-spot............109

*eremita Melitæa*..................109

*ericetorum, Urbanus*.............209

*erinna, Argynnis*................. 95

Erinna Fritillary................ 95

*eriphyle, Eurymus*............... 51

*errans, Prenes*...................227

*eryngii, Coenonympha*............ 67

ERYNNIS, GENUS..................212
  *afranius* .......................212
  *callidus* .......................213
  *funeralis* ......................214
  *juvenalis* ......................213
  *lacustra* .......................212
  *pernigra* .......................213
  *persius* ........................212
  *propertius* .....................214
  *tristis* .........................214

*eryphon, Incisalia*....167
*ethlius, Calpodes*....227

Euchloe, Genus.... 37
  *ausonides* .... 38
  *coloradensis* .... 39
  *creusa* .... 37
  *flavidalis* ....38, 281
  *hyantis* .... 37
  *lotta* .... 37
  *semiflava* ....38, 282

*eufala, Lerodea*....226
Eufala Skipper....226
*eunus, Pseudocopæodes*....217
Eunus Skipper....217

Euphydryas, Genus.... 97
  *albiradiata* ....104
  *anicia* ....269
  *augusta* ....103
  *augustina* ....103
  *baroni* ....100
  *capella* ....269
  *chalcedona* .... 97
  *colon* ....100
  *dwinnelli* .... 99
  *editha* ....101
  *fieldi* ....103
  *foxi* ....104
  *fusimacula* .... 98
  *fusisecunda* ....98, 303
  *hemiluteofuscus* .... 98
  *hemimelanica* ....98, 303
  *huellemanni* ....100, 305
  *macglashanii* .... 99
  *magdelenæ* ....106
  *mariana* .... 98
  *melanodisca* ....268
  *mirabilis* ....101
  *nubigena* ....104, 270
  *olancha* ....100
  *omniluteofuscus* .... 98
  *quino* ....102
  *rubicunda* ....103
  *rubrolimbata* ....269
  *rubrosuffusa* ....104, 305
  *sierra* ....105
  *suprafusa* ....98, 302
  *supranigrella* ....98, 303
  *umbrobasana* ....105, 304
  *wheeleri* ....106

Euptoieta, Genus.... 80
  *claudia* .... 80
  *hegesia* .... 80

Eurema, Genus.... 55
  *demoditas* .... 57
  *lisa* .... 56
  *euterpe* .... 56
  *mexicana* .... 55
  *nicippe* .... 56

*eurydice, Zerene*.... 46
*eurymedon, Papilio*.... 24

Eurymus, Genus.... 51
  *alba* .... 51
  *alexandra* .... 54
  *amphidusa* .... 51
  *autumnalis* .... 51
  *barbara* .... 52
  *behrii* .... 54
  *canescens* ....55, 286
  *chrysomelas* .... 52
  *edwardsii* .... 54
  *eriphyle* .... 51
  *eurytheme* .... 49
  *flava* .... 51
  *harfordii* .... 52
  *hatui* .... 54
  *shastæ* .... 52
  *suffusa* .... 49
  *weaveræ* .... 53

*eurytheme, Eurymus*.... 49
*euterpe, Eurema*.... 56

Everes, Genus....181
  *amyntula* ....182
  *comyntas* ....181

Evius Blue....186
*evius, Plebejus*....186
*exadeus, Epargyreus*....204
Exadeus Skipper....204
Exchanging ....254
*exilis, Brephidium*....178
*exoleta, Mitoura*....164
Eyed Blue....200

F

*fanniæ, Zerene* 48
Felder's Orange-tip 41
Field Crescent 116
Field Skipper 224
*fieldi, Euphydryas* 103
Field's Aberrant Checker-spot 103
Fiery Skipper 220
*flava, Eurymus* 51
*flava, Pieris* 31
Flavid Sulphur 51
Flavid White 31
*flavidalis, Euchloe* 38, 281
Forest Skipper 221
*foxi, Euphydryas* 104
Fox's Aberrant Checker-spot 104
Fox's Aberrant Lady 133
FRITILLARIES, THE 78
  Apache Fritillary 81
  Behren's Fritillary 83
  California Fritillary 87
  Callippe Fritillary 90
  Chitone Fritillary 82
  Clemence's Fritillary 88
  Coronis Fritillary 91
  Cottle's Fritillary 83
  Dark Fritillary 86
  Greenhorn Fritillary 85
  Gulf Fritillary 78
  Gunder's Fritillary 87
  Hydaspe Fritillary 84
  Irene Fritillary 86
  Lesser Leto Fritillary 82
  Lesser Unsilvered Fritillary 88
  Leto Fritillary 81
  Malcolm's Fritillary 94
  Mexican Fritillary 80
  Mormon Fritillary 95
  Nevada Fritillary 86
  Owen's Fritillary 94
  Plain Fritillary 92
  Purple Fritillary 85
  Royal Fritillary 84
  Rupestris Fritillary 91
  Semiramis Fritillary 90
  Shasta Fritillary 84
  Snyder's Fritillary 87
  Tehachapi Fritillary 94
  Tejon Fritillary 89
  Unsilvered Fritillary 89
  Variegated Fritillary 80
  Yuba Fritillary 91
  Zerene Fritillary 83
FRITILLARIES, SMALL 96
  Wawona Fritillary 96
  Western Meadow Fritillary 96
*fuliginosa, Satyrium* 170
*fulvescens, Strymon* 162
*fulvia, Vanessa* 132
*fumosus, Danaus* 59
*funeralis, Erynnis* 214
Funereal Dusky-wing 214
Fused Checker-spot 98
*fusisecunda, Euphydryas* 98, 303
*fusimacula, Euphydryas* 98

G

*gabbii, Melitæa* 108
Gabb's Checker-spot 108
*galactinus, Coenonympha* 66
*glaucon, Philotes* 192
GLAUCOPSYCHE, GENUS 197
  *antiacis* 200
  *australis* 198
  *behrii* 197
  *columbia* 198
  *huguenini* 200
  *lygdamus* 197
  *mertila* 200
  *polyphemus* 200
  *sinepunctata* 198, 309
  *xerces* 199
Glaucous Blue 192
Golden Hair-streak 161
Golden Sulphur 52
Golden-wing 122

GONIURUS, GENUS.................204
*dorantes* .....................205
*proteus* ......................204
*rauterbergi* ..................205
Gorgon Copper...................172
*gorgon, Heodes*................172
*gorgone, Phyciodes*............116
*gorgonioi, Phædrotes*..........197
Gossamer-wing, Sooty............170
*grandis, Aglais*...............126
Gray Blue.......................184
Gray Hair-streak................162
Great Arctic.................... 76
Great Copper....................172
Green Skipper...................219
Greenhorn Fritillary............ 85
Greenish Blue...................184
Grinnell's Butterfly............135
Grinnell's Dusky-wing...........213
Grinnell's Marble............... 40
Gross Anatomy of Butterflies....257
*grunus, Habrodais*.............154
Gulf Fritillary.................. 78
*gunderi, Argynnis*.............87, 298
*gunderi, Melitæa*..............108, 306
Gunder's Aberrant Copper .......175
Gunder's Aberrant Dog-face ...... 48
Gunder's Aberrant Hair-streak ...169
Gunder's Aberrant Lady .........133
Gunder's Aberrant Marine Blue .178
Gunder's Checker-spot ..........108
Gunder's Fritillary ............. 87
*gyas, Hemiargus*...............181

## H

HABRODAIS, GENUS................154
*grunus* .......................154
HAIR-STREAKS, THE...............154
Avalon Hair-streak..............157
Behr's Hair-streak..............169
Boisduval's Hair-streak.........154
Bramble Hair-streak.............168
Bronzed Hair-streak.............163
California Hair-streak..........159
Colorado Hair-streak............156
Columella Hair-streak...........156
Common Hair-streak..............157
Cuyamaca Hair-streak............163
Desert Hair-streak..............163
Dryope Hair-streak..............160
Golden Hair-streak..............161
Gunder's Aberrant Hair-streak..169
Gray Hair-streak................162
Great Purple Hair-streak........154
Hedge-row Hair-streak...........162
Immaculate Hair-streak..........159
Ines Hair-streak................157
John Muir's Hair-streak.........164
Johnson's Hair-streak...........164
Juniper Hair-streak.............165
Leda Hair-streak................156
Nut-brown Hair-streak...........156
Nelson's Hair-streak............164
Perplexing Hair-streak..........168
Purplish-brown Hair-streak......162
Skinner's Hair-streak...........167
Sylvan Hair-streak..............160
Tawny Hair-streak...............162
Thicket Hair-streak.............163
Hairy Swallowtail............... 18
*halesus, Atlides*..............154
Half-fused Checker-spot......... 98
Half-melanic Checker-spot....... 98
Half-yellow Marble.............. 38
Harris' White................... 34
*harfordii, Eurymus*............ 52
Harford's Sulphur............... 52
*hatui, Eurymus*................ 54
Hedge-row Hair-streak...........162
*hegesia, Euptoieta*............ 80
HELICONIINAE, SUBFAMILY......... 78
*helloides, Heodes*.............174

# INDEX

HEMIARGUS, GENUS ............... 181
  *gyas* ............... 181
  *isola* ............... 181
*hemiluteofuscus, Euphydryas* .... 98
*hemimelanica, Euphydryas* .... 98, 303

HEODES, GENUS ............... 172
  *clara* ............... 176
  *cupreus* ............... 175
  *editha* ............... 173
  *gorgon* ............... 172
  *helloides* ............... 174
  *heteronea* ............... 176
  *luctuosa* ............... 173
  *maculinita* ............... 175
  *mariposa* ............... 173
  *nivalis* ............... 174
  *rubidus* ............... 175
  *xanthoides* ............... 172

Hermes Copper ............... 172
*hermes, Tharsalea* ............... 172
*hermosa, Argynnis* ............ 81, 287

HESPERIA, GENUS ............... 217
  *columbia* ............... 217
  *comma* ............... 218
  *idaho* ............... 218
  *juba* ............... 218
  *morrisoni* ............... 217
  *nevada* ............... 219
  *oregonia* ............... 218
  *ruricola* ............... 219
  *viridis* ............... 219

HESPERIIDAE, FAMILY ............... 202

HESPERIINAE, SUBFAMILY ............... 216

HESPERIOIDEA, SUPERFAMILY ............... 202

HETEROCHROA, GENUS ............... 145
  *bredowii* ............... 145
  *californica* ............... 145
*heteronea, Heodes* ............... 176
Hewitson's Skipper ............... 216
Hilda Blue ............... 185
*hilda, Plebejus* ............... 185
*hippolyta, Argynnis* ............... 82
Hippolyta Fritillary ............... 82
Hoary Satyr ............... 70
*hoffmanni, Melitæa* ............... 111
Hoffmann's Checker-spot ............... 111
*hollandii, Papilio* ............... 20
Holland's Swallowtail ............... 20
*huguenini, Glaucopsyche* ............... 200
Huguenin's Blue ............... 200
*huellemanni, Euphydryas* .... 100, 305
Huellemann's Checker-spot ............... 100
*hyantis, Euchloe* ............... 37
*hydaspe, Argynnis* ............... 84
Hydaspe Fritillary ............... 84
*hygiæa, Aglais* ............... 126
*hylas, Polygonia* ............... 123

HYLEPHILA, GENUS ............... 220
  *phylæus* ............... 220

HYPAUROTIS, GENUS ............... 156
  *chrysalus* ............... 156

I

*icariodes, Plebejus* ............... 185
*idaho, Hesperia* ............... 218
Idaho Skipper ............... 218
*iduna, Oeneis* ............... 76
Immaculate Hair-streak ............... 159
*immaculosus, Strymon* ............... 159
*inachis, Kallima* ............... 62
*incana, Cercyonis* ............... 70
*incarnata, Dione* ............... 79

INCISALIA, GENUS ............... 167
  *eryphon* ............... 167
  *iroides* ............... 167
Ines Hair-streak ............... 157

*ines, Strymon* ............... 157
*indra, Papilio* ............... 21
Infra-fused Checker-spot ............... 98
*inornata, Argynnis* ............... 92
*intermedia, Philotes* ............... 193
*intermedia, Vanessa* ............... 135
Intermediate Blue ............... 193
*iole, Nathalis* ............... 36
*irene, Argynnis* ............... 86
Irene Fritillary ............... 86
*iroides, Incisalia* ............... 167
*isola, Hemiargus* ............... 181
Ivallda Arctic ............... 77
*ivallda, Oeneis* ............... 77

## J

*jacintoi, Melitæa*................112
John Muir's Hair-streak..........164
*johnsoni, Mitoura*................164
Johnson's Hair-streak............164
*juba, Argynnis*.................. 91
*juba, Hesperia*..................218
Juba Skipper...................218
*julia, Anthocharis*............... 44
Julia Orange-tip.................. 44
Juniper Hair-streak ............165
*juniperaria, Mitoura* ..........165, 288
Junonia, Genus ....................136
  *cœnia* ..........................136
  *nigrosuffusa* ....................138
  *schraderi* ......................138
*juvenalis, Erynnis* ...............213
Juvenal's Dusky-wing ...........213

## K

*Kallima inachis*.................. 62
*kerri, Danaus*..............60, 286
Kerr's Aberrant Queen.......... 60

## L

*labecula, Plebejus*................189
*lacinia, Chlosyne*................119
*lacustra, Erynnis*................212
*lanceolata, Anthocharis*........... 39
Large Marble.................... 38
Large Parnassian................ 27
Large Sulphurs.................. 45
Large White Skipper............209
*larvata, Libythea*................148
*laurina, Argynnis*................ 92
Leaf-butterfly .................... 62
Leanira Checker-spot.............113
*leanira, Melitæa*.................113
Least Satyr...................... 75
Leda Hair-streak................156
*leda, Strymon*...................156
Lemonias .......................106
Leona Checker-spot..............113
*leona, Melitæa*..................113
Lephelisca .......................151
Leptotes, Genus.................177
  *marina* .......................177
  *violacea* .....................178
Lerodea, Genus..................226
  *eufala* ........................226
Lesser Leto...................... 82
Lesser Unsilvered Fritillary...... 88
*letcheri, Vanessa*...............135
Letcher's Butterfly...............135
*letis, Argynnis*.................. 82
*leto, Argynnis*................... 82
Leto Fritillary................... 82
*libya, Pholisora*.................211
Libythea, Genus.................147
  *bachmanii* ....................147
  *larvata* .......................148
Libytheidae, Family............147
Life Zones, Map of..............245
*lisa, Eurema*.................... 56
List, Synonymic.................230
Little Satyr..................... 74
Little Sulphur................... 56
*lividus, Polygonus*...............203
*loki, Mitoura*....................167
Long-tailed Skipper..............204
*lorquini, Basilarchia*.............143
*lorquini, Parnassius*.............. 26
Lorquin's Admiral...............143
Lorquin's Parnassian............ 26
Lotis Blue.......................183
*lotis, Plebejus*..................183
*lotta, Euchloe*................... 37
*luctuosa, Heodes*.................173
Lupine Blue.....................189
*lupini, Plebejus*............189, 276
Lustrous Checker-spot...........113
Lustrous Copper.................175
Lycaenidae, Family..............177
Lycaeninae, Subfamily..........177
Lycaenopsis, Genus.............200
  *arizonensis* ...................201
  *cinerea* .......................201
  *echo* ..........................200
  *pseudargiolus* .................200

## M

*macaria, Argynnis* .... 92
Macaria Fritillary .... 92
Macaria, Unsilvered .... 92
*macglashanii, Euphydryas* .... 99
Macglashan's Checker-spot .... 99
*maculinita, Heodes* .... 175
*magdelenæ, Euphydryas* .... 106
*magnus, Parnassius* .... 27
*malcolmi, Argynnis* .... 94, 262
*malcolmi, Melitæa* .... 110, 307
Malcolm's Aberrant Blue .... 189
Malcolm's Checker-spot .... 110
Malcolm's Fritillary .... 94
*mammothi, Argynnis* .... 93
Map of Counties .... 244
Map of Life Zones .... 245

MARBLES, THE .... 37
  Boisduval's Marble .... 39
  Colorado Marble .... 39
  Edwards' Marble .... 37
  Grinnell's Marble .... 40
  Half-yellow Marble .... 38
  Large Marble .... 38
  Southern Marble .... 37
  Yellow Marble .... 38
*mardon, Polites* .... 222
Mardon Skipper .... 222
*marginalis, Apodemia* .... 151
*marginalis, Pieris* .... 34
Margined Dog-face .... 47
Margined White .... 34
Mariana Checker-spot .... 98
*mariana, Euphydryas* .... 98
Maricopa Blue .... 186
*maricopa, Plebejus* .... 186
*marina Leptotes* .... 177
Marine Blue .... 177
*mariposa, Heodes* .... 173
Marsyas Angle-wing .... 122
*marsyas, Polygonia* .... 122
*massachusettensis, Vanessa* .... 133
Meadow Skipper .... 221

MEGATHYMIDAE, FAMILY .... 228

MEGATHYMUS, GENUS .... 228
  *neumoegeni* .... 228
  *stephensi* .... 228
  *navajo* .... 229
  *yuccæ* .... 229
*mejicanus, Apodemia* .... 151
*melane, Poanes* .... 225
*melanodisca, Euphydryas* .... 268
Melanic Buckeye .... 138
*melinus, Strymon* .... 157
*melissa, Plebejus* .... 183

MELITAEA, GENUS .... 106
  *abnorma* .... 112
  *acastus* .... 110
  *alma* .... 114
  *approximata* .... 271
  *arachne* .... 271
  *bridgei* .... 283
  *carolynæ* .... 114
  *cerrita* .... 114
  *chara* .... 112
  *eremita* .... 109
  *gabbii* .... 108
  *gunderi* .... 108, 306
  *hoffmanni* .... 111
  *jacintoi* .... 112
  *leanira* .... 113
  *leona* .... 113
  *malcolmi* .... 110, 307
  *minuta* .... 271
  *monache* .... 115
  *neumoegeni* .... 106
  *newcombi* .... 108, 307
  *nitela* .... 113, 307
  *nympha* .... 271
  *obsoleta* .... 113
  *palla* .... 109
  *pearlæ* .... 111
  *pola* .... 115, 271
  *segregata* .... 112
  *stygiana* .... 110, 306
  *wardi* .... 110
  *whitneyi* .... 111
  *wrightii* .... 114
*menapia, Neophasia* .... 28
*menippe, Danaus* .... 58
Mertila Blue .... 200
*mertila, Glaucopsyche* .... 200

Metal-marks, The....149
  Behr's Metal-mark....149
  Desert Metal-mark....151
  Dusky Metal-mark....151
  Margined Metal-mark....151
  Mexican Metal-mark....151
  Mormon Metal-mark....149
  Southern Metal-mark....152
Mexican Dusky-wing....206
Mexican Fritillary.... 80
Mexican Metal-mark....151
Mexican Yellow.... 55
*mexicana, Eurema*.... 55
*mexicana, Thorybes*....206
*microstriata, Pieris*.... 34
Migration, Butterfly....127
*milberti, Aglais*....125
Milbert's Tortoise-shell....125
Milkweed Butterflies.... 58
Mimicry, Protective Coloration and. 61
*minuta, Melitæa*....271
*mirabilis, Euphydryas*....101
Mitoura, Genus....163
  *cuyamaca*....163
  *exoleta*....164
  *johnsoni*....165
  *juniperaria*....165, 288
  *loki*....167
  *muiri*....164
  *nelsoni*....164
  *spinetorum*....163
Mojave Sooty-wing....211
Monarch.... 58
Monarch, Smoky.... 59
Monache Checker-spot....115
*monache, Melitæa*....115
*montana, Phyciodes*....116
*monticola, Plebejus*....189, 277
*montivaga, Argynnis*.... 92
*mormo, Apodemia*....149
Mormon Fritillary.... 95
Mormon Metal-mark....149
*mormonia, Argynnis*.... 95
*morrisoni, Anthocharis*.... 41
*morrisoni, Hesperia*....217
Morrison's Orange-tip.... 41
Morrison's Skipper....217
Mountain Swallowtail.... 24
Mountain Vagabond.... 92
Mounting Specimens....248
Mourning-cloak....126
Mourning-garbed Copper....173
Mournful Dusky-wing....214
Mt. Baldy Blue....192
*muelleri, Vanessa*....135
Mueller's Butterfly....135
*muiri, Mitoura*....164
*multicaudata, Papilio*.... 23
Mustard White.... 33
Mylitta Crescent....117
*mylitta, Phyciodes*....117

N

*napi, Pieris*.... 33
Nathalis, Genus.... 36
  *iole*.... 36
*navajo, Megathymus*....229
Navajo Skipper....229
*nelsoni, Mitoura*....164
Nelson's Hair-streak....164
*nemesis, Calephelis*....151
*nemorum, Ochlodes*....221
Neominois, Genus.... 69
  *ridingsii*.... 69
Neophasia, Genus.... 28
  *menapia*.... 28
  *nigracosta*....29, 267
*neumoegeni, Megathymus*....228
*neumoegeni, Melitæa*....106
Neumoegen's Checker-spot....106
*neurona, Plebejus*....190, 280
Nevada Copper....171
Nevada Dusky-wing....206
Nevada Fritillary.... 86
*nevada, Hesperia*....219
Nevada Skipper....219
*nevada, Thorybes*....206

*nevadensis, Argynnis*............ 86
*nevadensis, Oeneis*............... 76
*newcombi, Melitæa*............108, 307
*newcombi, Zerene*............... 48
Newcomb's Aberrant Dog-face.... 48
Newcomb's Checker-spot.........108
*nicippe, Eurema*................. 56
Nicippe Yellow................. 56
*niger, Parnassius*................ 27
*nigracosta, Neophasia*.........29, 267
*nigrescens, Chlosyne*.............120
*nigroinita, Callipsyche*...........169
*nigrosuffusa, Junonia*............138
*nitela, Melitæa*.............113, 307
Nivalis Copper...................174
*nivalis, Heodes*..................174
Northern California Ringlet...... 67
Northern Checker-spot...........109
*novangliæ, Pieris*................ 36
*nubigena, Euphydryas*........104, 270
*nubila, Tharsalea*...........171, 308
Nut-brown Hair-streak...........161
NYMPHALIDAE, FAMILY........... 78
Nymphs, Wood.................. 70

O

*obsoleta, Basilarchia*............145
*obsoleta, Melitæa*................113
Obsolete Checker-spot............113
*occidentalis, Pieris*............... 32
*occidentalis, Urbanus*............207
OCHLODES, GENUS...............221
  *agricola* .......................222
  *nemorum* ....................221
  *pratincola* ....................221
  *sylvanoides* ...................221
  *yuma* .........................222
OENEIS, GENUS.................. 76
  *iduna* ......................... 76
  *ivallda* ........................ 77
  *nevadensis* .................... 76
*oetus, Cercyonis*................. 75
Olancha Checker-spot............100
*olancha, Euphydryas*.............100
*oleracea, Pieris*.................. 34
*omniluteofuscus, Euphydryas*..... 98
Orange-margined Blue...........183
ORANGE-TIPS, THE................ 39
  Desert Orange-tip.............. 42
  Felder's Orange-tip............ 41
  Julia Orange-tip............... 44
  Morrison's Orange-tip.......... 41
  Pima Orange-tip............... 42
  Sara Orange-tip................ 42
  Stellar Orange-tip.............. 43
  Tinted Desert Orange-tip...... 42
*oreas, Polygonia*................124
Oregon Blue.....................191
Oregon Skipper..................218
Oregon Swallowtail.............. 19
*oregonensis, Philotes*.............191
*oregonia, Hesperia*...............218
*oregonia, Papilio*................ 19
Original Descriptions............261
Orseis Crescent.................117
*orseis, Phyciodes*................117
*oweni, Argynnis* ............... 94
Owen's Fritillary................ 94
Owl Butterfly................... 62

P

PAINTED LADIES..................131
  Edwards' Painted Lady........131
  The Painted Lady............133
*palæmon, Pamphilidia*...........216
Pale Swallowtail................ 24
*palla, Melitæa*...................109

Pallid Sulphur .................. 46
*pallida, Catopsilia* .............. 46
*pallida, Pieris* .................. 33
*palmerii, Apodemia* .............151

Pamphilidia, Genus .............216
  *palæmon* .......................216
Papering ........................253

Papilio, Genus .................. 17
  *ajax* .......................... 19
  *albanus* ....................... 24
  *ammoni* ........................ 23
  *asterius* ...................... 19
  *bairdii* ....................... 19
  *brucei* ........................ 19
  *eurymedon* ..................... 24
  *hirsuta* ....................... 18
  *hollandii* ..................... 20
  *indra* ......................... 21
  *marcellus* ..................... 19
  *multicaudata* .................. 23
  *obsoleta* ...................... 17
  *oregonia* ...................... 19
  *pergamus* ...................... 22
  *philenor* ...................... 17
  *pilumnus* ...................... 23
  *polydamas* ..................... 18
  *rutulus* ....................... 22
  *zelicaon* ...................... 20

Papilionidae, Family ............ 17

Parnassians, The ................ 25
  Baldur Parnassian ............. 26
  Behr's Parnassian ............. 27
  Dyar's Parnassian ............. 25
  Large Parnassian .............. 27
  Lorquin's Parnassian .......... 26
  Wright's Parnassian ........... 27

Parnassians, Genus .............. 25
  *altaurus* ...................... 25
  *baldur* ........................ 26
  *behrii* ........................ 27
  *binigrimaculella* .............. 26
  *claudianus* .................... 25
  *clodius* ....................... 25
  *lorquini* ...................... 26
  *magnus* ........................ 27
  *niger* ......................... 27
  *smintheus*, egg ................ 26
  *smintheus*, caterpillar ........ 27

Pasadena Checker-spot ...........108
*pasadenæ, Melitæa* ..............108

Patched Butterflies .............119
  Bordered Patch ................119
  California Patch ..............120
  Chino Patch ...................120
  Crocale Patch .................119
  Dusky Patch ...................120
  Rufescent Patch ...............119
*paulus, Cercyonis* .............. 74
Peacock Butterflies .............136
*pearlæ, Melitæa* ................111
*pergamus, Papilio* .............. 12
*pernigra, Erynnis* ..............213
*perplexa, Callophrys* ...........168
Perplexing Hair-streak ..........168

Phaedrotes, Genus ...............196
  *catalina* ......................197
  *gorgonioi* .....................197
  *piasus* ........................196
Phaon Crescent ..................116
*phaon, Phyciodes* ...............116
*Phasiana curvata* ...............165
Pheres Blue .....................187
*pheres, Plebejus* ...............187

Philotes, Genus .................191
  *baldyensis* ....................192
  *battoides* .....................191
  *bernardino* ....................192
  *comstocki* .....................196
  *enoptes* .......................193
  *glaucon* .......................192
  *intermedia* ....................193
  *oregonensis* ...................191
  *rita* ..........................193
  *sonoralba* .....................195
  *sonorensis* ....................194
  *speciosa* ......................194

Pholisora, Genus ................210
  *alpheus* .......................210
  *catullus* ......................211
  *libya* .........................211

# INDEX

PHYCIODES, GENUS ....116
*campestris* ....116
*gorgone* ....116
*montana* ....116
*mylitta* ....117
*orseis* ....117
*phaon* ....116
*picta* ....118
*phylace, Amblyscirtes* ....226
Phylace Skipper ....226
*phylæus, Hylephila* ....220
*piasus, Phædrotes* ....196
*picta, Phyciodes* ....118
Pigmy Blue ....178
PIERIDAE, FAMILY .... 28
PIERIS, GENUS .... 29
*beckerii* .... 29
*calyce* .... 33
*castoria* .... 34
*elivata* .... 31
*flava* .... 31
*flavitincta* .... 31
*marginalis* .... 34
*microstriata* .... 34
*napi* .... 33
*novangliæ* .... 36
*occidentalis* .... 32
*oleracea* .... 34
*pallida* .... 33
*protodice* .... 31
*rapæ* .... 35
*sisymbrii* .... 30
*venosa* .... 34
*vernalis* .... 32
*yreka* .... 35
*pilumnus, Papilio* .... 23
*pima, Anthocharis* .... 42
Pima Orange-tip .... 42
Pine White .... 28
Plain Fritillary .... 92
PLEBEJUS, GENUS ....183
*acmon* ....188, 276
*aehaja* ....185
*antægon* ....276
*anna* ....183
*aquilo* ....184
*carolyna* ....190, 278
*chlorina* ....190, 277
*comstocki* ....187
*cottlei* ....188, 266
*daedalus* ....186
*emigdionis* ....191, 278
*evius* ....186
*hilda* ....185
*icarioides* ....185
*labecula* ....189
*lotis* ....183
*lupini* ....189, 276
*malcolmi* ....189
*maricopa* ....186
*melissa* ....183
*monticola* ....189, 277
*neurona* ....190, 280
*pallida* ....189
*pheres* ....187
*podarce* ....184
*rufescens* ....184
*saepiolus* ....184
*spinimaculata* ....186
POANES, GENUS ....225
*melane* ....225
*taxiles* ....225
*podarce, Plebejus* ....184
*pola, Melitæa* ....115, 271
POLYGONIA, GENUS ....121
*chrysoptera* ....122
*faunus* ....122
*hylas* ....123
*marsyas* ....122
*oreas* ....124
*rusticus* ....122
*satyrus* ....121
*silenus* ....124
*zephyrus* ....123
POLYGONUS, GENUS ....203
*arizonensis* ....203
*lividus* ....203
POLITES, GENUS ....222
*comstocki* ....223
*mardon* ....222
*sabuleti* ....223
*sonora* ....222
*tecumseh* ....223

Polyphemus Blue................200
*polyphemus, Glaucopsyche*.........200
Powdered Skipper................210
*pratincola, Ochlodes*.............221
PRENES, GENUS..................227
  *errans* ......................227
Preservation of Specimens........246
Propertius Dusky-wing...........214
*propertius, Erynnis*..............214
Protective Coloration and Mimicry. 61
*proteus, Goniurus*...............204
*protodice, Pieris*................. 31
*pseudargiolus, Lycænopsis*.......200
PSEUDOCOPAEODES, GENUS..........217
  *eunus* ........................217
*Pseudohazis eglanterina*..........294
Publications, Entomogolical.......255
*pulla, Coenonympha*.............. 67
*pulverulenta, Antigonus*..........210
Purple Fritillary................. 85
Purplish-brown Hair-streak.......162
Purplish Copper.................174
*purpurascens, Argynnis*.......... 85
Pyrameis ......................131

Q

Queen, Kerr's Aberrant.......... 60
Queen, Striated.................. 60
*quino, Eupyhdryas*...............102

R

*rapæ, Pieris*..................... 35
*rauterbergi, Goniurus*............205
Rauterberg's Skipper.............205
*reakirtii, Anthocharis*............ 43
Reakirt's Blue .................181
Reakirt's Copper ................173
Reakirt's Orange-tip ............ 43
Reakirt's White ................. 34
Relaxing Specimens.............253
Riding's Satyr................... 69
*ridingsii, Neominois*............. 69
RINGLETS, THE.................... 65
  Ampelos Ringlet............... 67
  Boisduval's Ringlet............ 66
  California Ringlet............. 65
  Elko Ringlet.................. 68
  Northern California Ringlet.... 67
  Siskiyou Ringlet.............. 67
RIODINIDAE, FAMILY.............149
Rita Blue.......................193
*rita, Philotes*...................193
Roadside Skipper................225
*rosa, Zerene*.................... 49
Roseate Dog-face................ 49
Royal Fritillary................. 84
*rubicunda, Euphydryas*..........103
*rubidus, Heodes*.................175
*rubrolimbata, Euphydryas*.......269
*rubrosuffusa, Euphydryas*....104, 305
Ruddy Checker-spot..............103
Ruddy Copper...................175
*rufescens, Plebejus*..............184
Rufescent Blue..................184
Rufescent Patch.................119
*rupestris, Argynnis*.............. 91
Rupestris Fritillary.............. 91
Rural Skipper...................222
*ruralis, Urbanus*.................206
*ruricola, Hesperia*...............219
Rustic Angle-wing...............122
Rustic Skipper..................219
*rusticus, Polygonia*..............122
*rutulus, Papilio*................. 22

S

*saepiolus, Plebejus*..............184
*saepium, Strymon*................162
San Bernardino Blue.............192
San Emigdio Blue...............191
San Gorgonio Arrowhead Blue...197
San Jacinto Checker-spot.........112
Sandhill Skipper................223
*sara, Anthocharis*................ 42
Sara Orange-tip.................. 42
Satyr, The......................121

SATYRIDAE, FAMILY .... 65
SATYRIUM, GENUS .... 170
  *fuliginosa* .... 170
SATYRS .... 65, 69
  Ariane Satyr .... 71
  Baron's Satyr .... 70
  Behr's Satyr .... 72
  Boisduval's Satyr .... 73
  Boopis Satyr .... 70
  Hoary Satyr .... 70
  Least Satyr .... 75
  Little Satyr .... 74
  Riding's Satyr .... 69
  Stephen's Satyr .... 71
  Sylvan Satyr .... 73
  Wheeler's Satyr .... 72
*satyrus, Polygonia* .... 121
*schraderi, Junonia* .... 138
Schrader's Aberrant Buckeye .... 138
*scriptura, Urbanus* .... 207
*segregata, Melitæa* .... 112
Segregated Checker-spot .... 112
Selective Breeding of Butterflies .. 138
*semiflava, Euchloe* .... 38, 282
*semiramis, Argynnis* .... 90
Semiramis Fritillary .... 90
Senna Sulphur .... 45
*sennæ, Catopsilia* .... 45
Shasta Blue .... 187
Shasta Fritillary .... 84
*shasta, Plebejus* .... 187
*shastæ, Eurymus* .... 52
*shastaensis, Argynnis* .... 84, 295
Shipping Butterflies .... 254
Short-tailed Swallowtail .... 21
Sierra Checker-spot .... 105
*sierra, Euphydryas* .... 105
Silenus Angle-wing .... 124
*silenus, Polygonia* .... 124
Silver-spots .... 78
Silver-spotted Skipper .... 203
*silvestris, Cercyonis* .... 73
*sinepunctata, Glaucopsyche* .. 198, 309
Siskiyou Ringlet .... 67
*siskiyouensis, Coenonympha* .. 67, 290
Sisters, The .... 145
*sisymbrii, Pieris* .... 30
*skinneri, Urbanus* .... 208
Skinner's Aberrant Skipper .... 208
Skinner's Arizona Skipper .... 203
Skinner's Blue .... 190
Skinner's Hair-streak .... 167
SKIPPERS, THE .... 203
  Arctic Skipper .... 216
  Brazilian Skipper .... 227
  Columbia Skipper .... 217
  Desert Sandhill Skipper .... 223
  Dun Skipper .... 224
  Eufala Skipper .... 226
  Eunus Skipper .... 217
  Exadeus Skipper .... 204
  Field Skipper .... 224
  Fiery Skipper .... 220
  Forest Skipper .... 221
  Green Skipper .... 219
  Hewitson's Skipper .... 216
  Idaho Skipper .... 218
  Juba Skipper .... 218
  Larke White Skipper .... 209
  Long-tailed Skipper .... 204
  Mardon Skipper .... 222
  Meadow Skipper .... 221
  Morrison's Skipper .... 217
  Navajo Skipper .... 229
  Nevada Skipper .... 219
  Oregon Skipper .... 218
  Phylace Skipper .... 226
  Powdered Skipper .... 210
  Rauterberg's Skipper .... 205
  Roadside Skipper .... 225
  Rural Skipper .... 222
  Rustic Skipper .... 219
  Sandhill Skipper .... 223
  Silver-spotted Skipper .... 203
  Skinner's Aberrant Skipper .... 208
  Skinner's Arizona Skipper .... 203
  Small Checkered Skipper .... 207
  Sonora Skipper .... 222
  Stephen's Skipper .... 228
  Taxiles Skipper .... 225
  Tecumseh Skipper .... 223
  Two-banded Skipper .... 206
  Umber Skipper .... 225
  Wandering Skipper .... 227
  Western Checkered Skipper .... 207
  Woodland Skipper .... 221
  Yuma Skipper .... 222
Small Blue .... 194
Small Checkered Skipper .... 207
Small Fritillaries .... 96
Small Sulphurs .... 55
Small Veined White .... 34
*smintheus, Parnassius*, egg .... 26
*smintheus, Parnassius*, caterpillar. 27
Smoky Monarch .... 59

Snout Butterflies .... 147
  The Snout Butterfly .... 147
  Southern Snout Butterfly .... 148
*snyderi, Argynnis* .... 87
Snyder's Fritillary .... 87
Sonora Blue .... 194
*sonoralba, Philotes* .... 195
*sonorensis, Philotes* .... 194
*sonora, Polites* .... 222
Sonora Skipper .... 222
Sooty-wing, The .... 211

Sooty-wings .... 210
  Alphaeus Sooty-wing .... 210
  Mojave Sooty-wing .... 210
Sooty Gossamer-wing .... 170
Southern Blue .... 198
Southern Dog-face .... 48
Southern Marble .... 37
Southern Metal-mark .... 152
Southern Snout Butterfly .... 148
*speciosa, Philotes* .... 194
*spinetorum, Mitoura* .... 163
*spinimaculata, Plebejus* .... 186
Square-spotted Blue .... 191
Stellar Orange-tip .... 43
*stephensi, Cercyonis* .... 71
*stephensi, Megathymus* .... 228
Stephen's Satyr .... 71
Stephen's Skipper .... 228
*stella, Anthocharis* .... 43
*sthenele, Cercyonis* .... 73
Striated Queen .... 60
*strigosa, Danaus* .... 60

Strymon, Genus .... 156
  *adenostomatis* .... 162
  *auretorum* .... 161
  *avalona* .... 157
  *californica* .... 159
  *chalcis* .... 163
  *chlorophora* .... 162
  *columella* .... 156
  *desertorum* .... 160
  *dryope* .... 160
  *fulvescens* .... 162
  *immaculosus* .... 159
  *ines* .... 157
  *leda* .... 156
  *melinus* .... 157
  *saepium* .... 162
  *spadix* .... 161
  *titus* .... 159

Stygian Checker-spot .... 110
*stygiana, Melitæa* .... 110, 306
*suffusa, Eurymus* .... 49
Suffused Lady .... 134

Sulphurs, The .... 49
  Barbara Sulphur .... 52
  Behr's Albinic Sulphur .... 55
  Behr's Sulphur .... 54
  Boisduval's Sulphur .... 49
  Cockerell's Sulphur .... 51
  Delia Sulphur .... 57
  Edwards' Sulphur .... 54
  Flavid Sulphur .... 51
  Golden Sulphur .... 52
  Harford's Sulphur .... 52
  Little Sulphur .... 56
  Yellow Sulphur .... 51

Sulphurs, The Large .... 45
  Pallid Sulphur .... 46
  Senna Sulphur .... 45

Sulphurs, The Small .... 55
*suprafusa, Euphydryas* .... 98, 302
Supramelanic Checker-spot .... 98
*supranigrella, Euphydryas* .... 98, 303

Swallowtails, The .... 17
  Ammon's Swallowtail .... 23
  Anise Swallowtail .... 20
  Baird's Swallowtail .... 19
  Bruce's Swallowtail .... 19
  Daunus Swallowtail .... 23
  Edwards' Swallowtail .... 22
  Hairy Swallowtail .... 18
  Holland's Swallowtail .... 20
  Mountain Swallowtail .... 24
  Oregon Swallowtail .... 19
  Pale Swallowtail .... 24
  Pipe-vine Swallowtail .... 17
  Polydamas Swallowtail .... 18
  Short-tailed Swallowtail .... 21
  Two-tailed Swallowtail .... 21
  Western Tiger Swallowtail .... 22

Sylvan Hair-streak .... 160

Sylvan Satyr .... 73

*sylvanoides, Ochlodes* .... 221

*sylvinus, Strymon* .... 160

Synonymic List .... 230

**T**

Tawny Hair-streak..............162
*taxiles, Poanes*....................225
Taxiles Skipper.................225
*tecumseh, Polites*................223
Tecumseh Skipper...............223
Tehachapi Fritillary.............. 94
*tehachapina, Argynnis*........94, 263
Tejon Fritillary.................. 89
*tejonica, Argynnis*...........89, 300
*tessellata, Urbanus*...............207
THARSALEA, GENUS...............170
  *arota* .........................170
  *hermes* .......................172
  *nubila* ....................171, 308
  *virginiensis* ..................171
THECLINAE, SUBFAMILY..........154
Thicket Hair-streak.............163
THORYBES, GENUS.................206
  *mexicana* ....................206
  *nevada* .......................206
Tiger Swallowtail, Western........ 22
Tinted Desert Orange-tip.......... 42
Tinted Cabbage White............ 36
*titus, Strymon*...................159
*tityrus, Epargyreus*..............203
TORTOISE-SHELLS .................124
  California Tortoise-shell........124
  Cockerell's Tortoise-shell........126
  Milbert's Tortoise-shell.........125
*tristis, Erynnis*...................214
Two-banded Skipper.............206
Two-tailed Swallowtail........... 23

**U**

Umber Skipper...................225
*umbrobasana, Euphydryas*....105, 304
Unsilvered Fritillary.............. 89
Unsilvered Macaria.............. 92
Unspotted Southern Blue........198
URBANIDAE, SUBFAMILY...........203
URBANUS, GENUS..................206
  *ericetorum* ...................209
  *occidentalis* ..................207
  *ruralis* .......................206
  *scriptura* ....................207
  *skinneri* .....................208
  *tessellata* ....................207

**V**

VANESSA, GENUS..................131
  *ahwashtee* ...................133
  *atalanta* .....................131
  *cardui* .......................133
  *carye* ........................134
  *edwardsi* ....................131
  *elymi* ........................134
  *fulvia* ........................132
  *intermedia* ...................135
  *letcheri* .......................135
  *massachusettensis* ............133
  *muelleri* ......................135
  *virginiensis* ...................132
*vanillæ, Dione*.................... 78
Varied Blue......................176
Variegated Fritillary.............. 80
Vagabond, Mountain.............. 92
Veined Blue.....................190
Veined White.................... 34
*venosa, Pieris*................... 34
Vernal White.................... 32
*vernalis, Pieris*.................. 32
*vestris, Atrytone*................224
*vialis, Amblyscirtes*..............225
*violacea, Leptotes*...............178
*viridis, Hesperia*.................219
Virginia Lady....................132
*virginiensis, Tharsalea*...........171
*virginiensis, Vanessa*.............132
*virgulti, Apodemia*...............149
*viridicornis, Argynnis*.......85, 292

**W**

Walking-stick Insect.............. 62
Wandering Skipper...............227
*wardi, Melitæa*..................110
Ward's Aberrant Checker-spot....110
Wawona Fritillary.............. 96
*wawonæ, Brenthis*................ 96
*weaveræ, Eurymus*............... 53
*weidemeyrii, Basilarchia*..........143
Weidemeyr's Admiral.............143
West Coast Lady.................134
Western Banded Elfin.............167
Western Checkered Skipper........207
Western Elfin....................167
Western Meadow Fritillary........ 96
Western Tailed Blue..............182
Western Tiger Swallowtail........ 22
Western White................... 32
*wheeleri, Cercyonis*.............. 72
*wheeleri, Euphydryas*.............106
Wheeler's Checker-spot...........106
Wheeler's Satyr.................. 72
White-spotted Blue...............195
WHITES, THE.................... 28
  Becker's White................ 29
  California White.............. 30
  Common White.................. 31
  Edwards' White................ 33
  Flavid White.................. 31
  Harris' White................. 34
  Margined White................ 34
  Mustard White................. 33
  Pine White.................... 28
  Reakirt's White............... 34
  Tinted Cabbage White.......... 36
  Veined White.................. 34
  Vernal White.................. 32
  Western White................. 32
*whitneyi, Melitæa*...............111
Whitney's Checker-spot...........111
Wood Nymphs.................... 70
Woodland Skipper................221
*wrighti Anthocharis* ..........44, 282
*wrightii, Melitæa*................114
Wright's Aberrant Orange-tip..... 44
Wright's Aberrant Parnassian..... 27
Wright's Checker-spot............114
Wright's Dusky-wing ............212

**X**

*xanthoides, Heodes*..............172
Xerces Blue.....................199
*xerces, Glaucopsyche*.............199

**Y**

Yellow Marble................... 38
Yellow, Mexican.................. 55
Yellow, Nicippe.................. 56
Yellow Sulphur.................. 51
Yellows, Dwarf.................. 36
Yosemite Blue...................187
*yreka, Pieris*.................... 35
Yuba Fritillary.................. 91
Yucca Borers....................228
*yuccæ, Megathymus*...............229
*yuma, Ochlodes*..................222
Yuma Skipper....................222

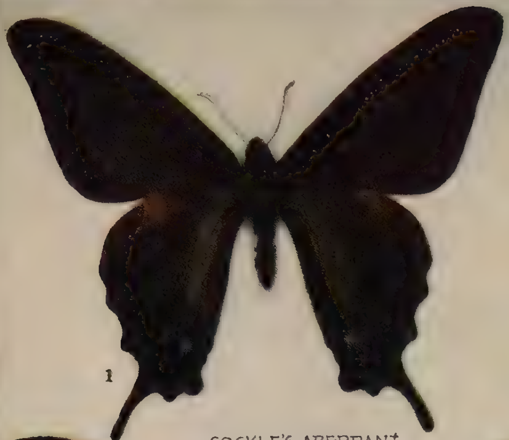
**Z**

Zephyr, The.....................123
*zephyrus, Polygonia*..............123
*zerene, Argynnis*................. 83
Zerene Fritillary................. 83
ZERENE, GENUS.................. 46
  *amorphæ* .................... 48
  *bernardino* .................. 47
  *caesonia* .................... 48
  *eurydice* .................... 46
  *fanniæ* ..................... 48
  *newcombi* .................. 48
  *rosa* ....................... 49

# *Butterflies of California*
## *Colored Plates*

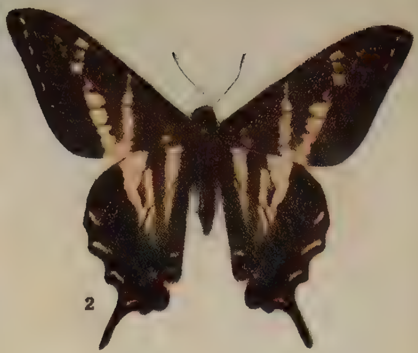
# EXPLANATION OF PLATE 1

| | | Text Page |
|---|---|---|
| Fig. 1. | *Papilio eurymedon albanus* ab. *cocklei* Gunder. ♂, Kaslo, B. C. May 24, 1924. Type. (Not included in the text as it is unrecorded for California). | |
| Fig. 2. | *P. eurymedon albanus* F. & F. ♂, Willow Ranch, Modoc Co., Cal. June, 1925. Courtesy Jean Gunder. | 24 |
| Fig. 3. | *P. rutulus ammoni* Behrens ♀, near Warner's Hot Spgs., San Diego Co., Cal. July 9, 1919. Courtesy Jean Gunder. | 23 |
| Fig. 4. | *P. polydamas* L. ♀, Santa Monica, Cal., September 16, 1924. Courtesy Dr. F. C. Clark | 18 |
| Fig. 5. | *P. bairdii oregonia* Edw. ♂, Nespelem, Wash. Aug., 1917. | 19 |
| Fig. 6. | *P. bairdii brucei* Edw. ♂, Round Valley, Inyo Co., Cal. July 20, 1923 | 19 |
| Fig. 7. | *P. bairdii hollandii* Edw. ♂, reproduced from W. J. Holland's figure | 20 |



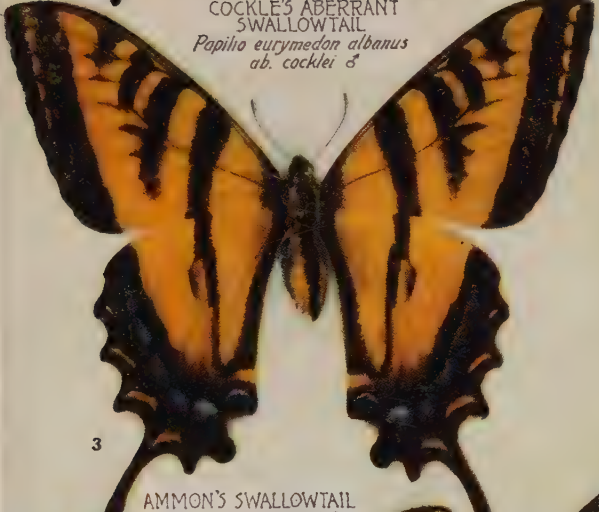
1

COCKLE'S ABERRANT SWALLOWTAIL
*Papilio eurymedon albanus ab. cocklei* ♂



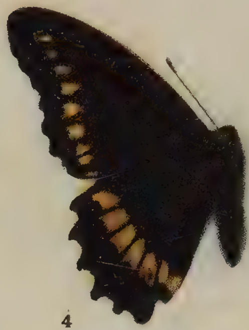
2

MOUNTAIN SWALLOWTAIL
*P. eurymedon albanus.* ♂



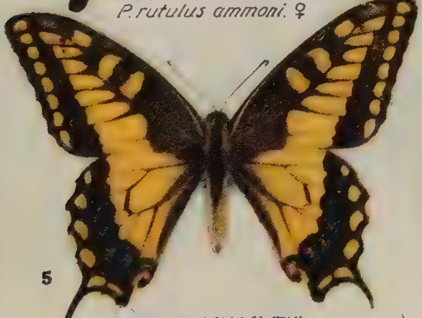
3

AMMON'S SWALLOWTAIL
*P. rutulus ammoni.* ♀



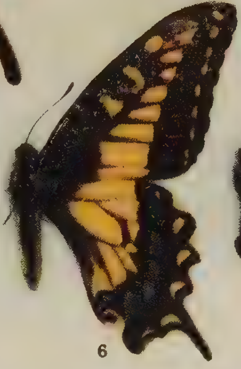
4

POLYDAMAS SWALLOWTAIL
*P. polydamas* ♀



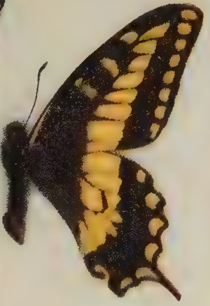
5

OREGON SWALLOWTAIL
*P. bairdii oregonia.* ♂



6

BRUCE'S SWALLOWTAIL
*Papilio bairdii brucei* ♂.



7

HOLLAND'S SWALLOWTAIL
*P. bairdii hollandii* ♂

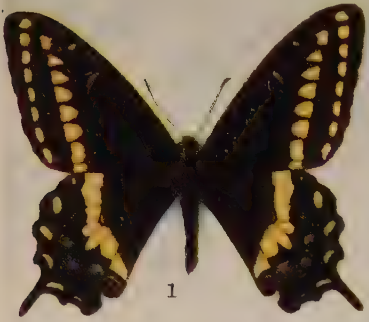
THE SWALLOWTAILS

All figures reduced

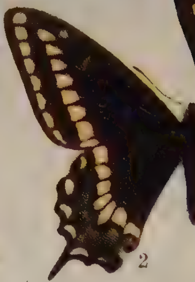
Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 2

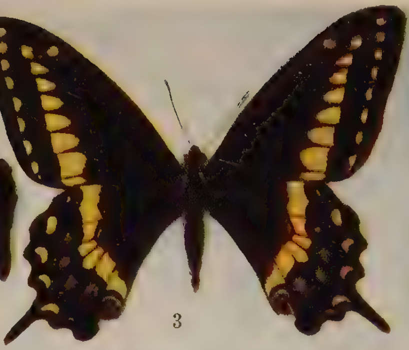
| | | Text Page |
|---|---|---|
| Fig. 1. | *Papilio indra pergamus* Hy. Edw. ♂, San Bernardino Mts., Cal. May 10, 1922 | 22 |
| Fig. 2. | *P. indra pergamus* Hy. Edw. ♂, under side, San Bernardino Mts., Cal. May 5, 1920 | 22 |
| Fig. 3 | *P. indra pergamus* Hy. Edw. ♀, San Bernardino Mts., Cal. May 5, 1920 | 22 |
| Fig. 4. | *P. philenor* L. ♂, Decorah, Iowa. July 5, 1918 | 17 |
| Fig. 5. | *P. philenor* L. ♀, under side, Decorah, Iowa. July 5, 1918 | 17 |
| Fig. 6. | *P. philenor hirsuta* Skin. ♂, Eldredge, Sonoma Co., Cal. April 22, 1917 | 18 |
| Fig. 7. | *P. philenor hirsuta* Skin. ♀, under side, Eldredge, Sonoma Co., Cal. April 22, 1917 | 18 |
| Fig. 8. | *P. philenor hirsuta* Skin. ♀, Marin Co., north of San Francisco Bay. July, 1916 | 18 |


1

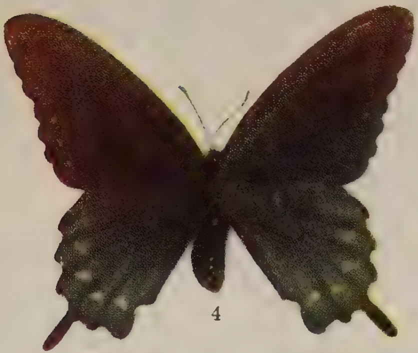
EDWARD'S SWALLOWTAIL
(*P. indra pergamus*) ♂


2

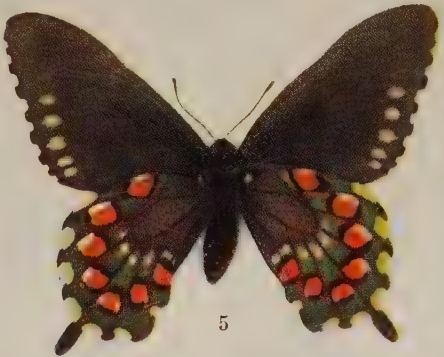
EDWARDS SWALLOWTAIL
Under side ♂


3

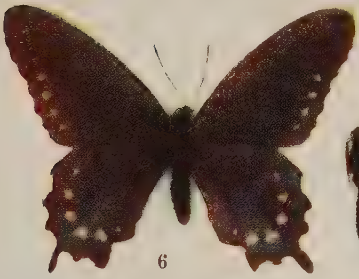
EDWARD'S SWALLOWTAIL
(*P. indra pergamus*) ♀


4

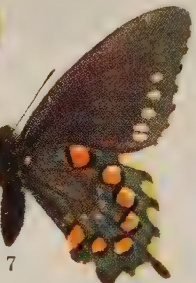
The PIPE-VINE SWALLOWTAIL
(*Papilio philenor*) ♂


5

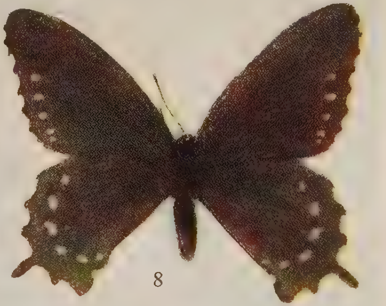
The PIPE-VINE SWALLOWTAIL
(*Papilio philenor*) ♀


6

The HAIRY SWALLOWTAIL
(*P. philenor hirsuta*) ♂


7

The HAIRY SWALLOWTAIL
Under side ♀


8

The HAIRY SWALLOWTAIL
(*P. philenor hirsuta*) ♀

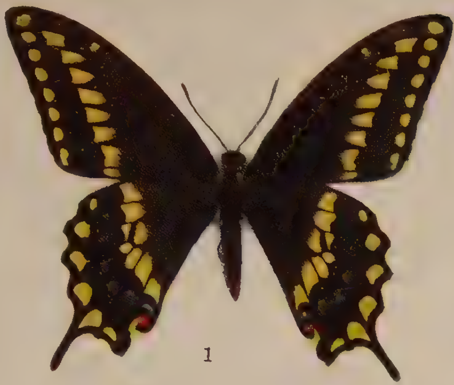
The SWALLOWTAILS

All figures reduced

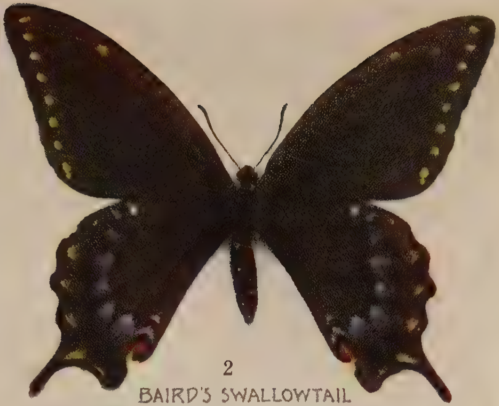
Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 3

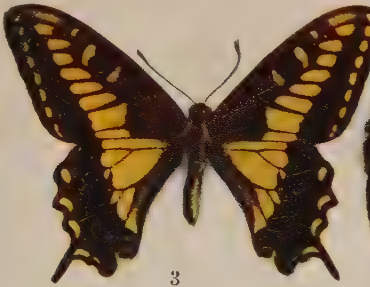
| | | Text Page |
|---|---|---|
| Fig. 1. | *Papilio bairdii* Edw. ♂, Santa Ana Canyon, Cal. El. 5,500 ft. Aug. 4, 1907 | 19 |
| Fig. 2. | *P. bairdii* Edw. ♀, Santa Ana Canyon, Cal. El. 5,500 ft. Aug. 4, 1907 | 19 |
| Fig. 3. | *P. zelicaon* Luc. ♂, Los Angeles, Cal. Sept. 5, 1920 | 20 |
| Fig. 4. | *P. zelicaon* Luc. ♀, Los Angeles, Cal. Sept. 12, 1922 | 20 |
| Fig. 5. | *P. zelicaon* Luc. ♀, under side, Los Angeles, Cal. Sept. 5, 1920 | 20 |
| Fig. 6. | *P. indra* Reak. ♂, Yosemite Park, Cal. July 19, 1916. Courtesy Drs. Dain and Cora Tasker | 21 |
| Fig. 7. | *P. indra* Reak. ♂, under side, Port Columbia, Wash. May 1, 1916 | 21 |
| Fig. 8. | *P. indra* Reak. ♀, Port Columbia, Wash. May 1, 1916 | 21 |



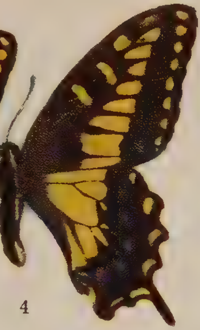
1
BAIRD'S SWALLOWTAIL
*(Papilio bairdi)* ♂



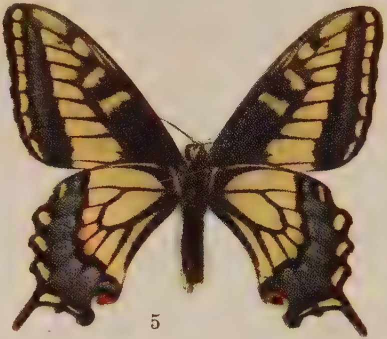
2
BAIRD'S SWALLOWTAIL
*(Papilio bairdi)* ♀



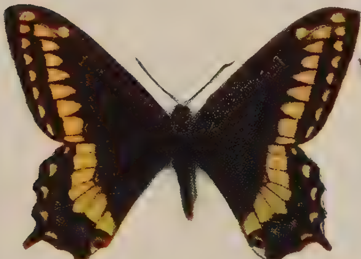
3
*The* ANISE SWALLOWTAIL
*(Papilio zelicaon)* ♂



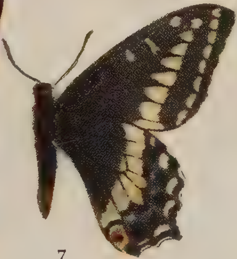
4
*The* ANISE
SWALLOWTAIL ♀



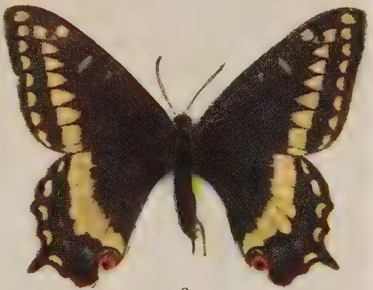
5
*The* ANISE SWALLOWTAIL
*(P. zelicaon) Under side* ♀



6
*The* SHORT-TAILED
SWALLOWTAIL *(P. indra)* ♂



7
*(Papilio indra)* ♂
*Under side.*



8
*The* SHORT-TAILED
SWALLOWTAIL *(P. indra)* ♀

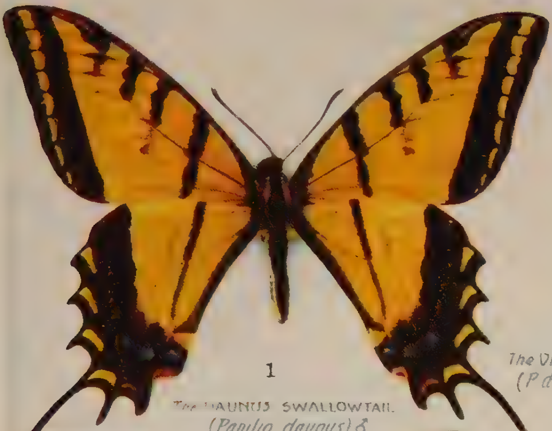
*The* SWALLOWTAILS

All figures reduced

Copyright 1927, John A. Comstock

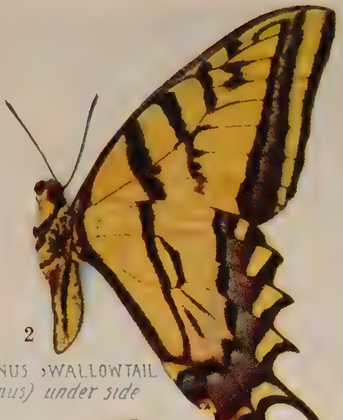
## EXPLANATION OF PLATE 4

| | | Text Page |
|---|---|---|
| Fig. 1. | *Papilio multicaudata* Kirby. (Syn. daunus Bdv.) ♂, Utah, July 4, 1899 | 23 |
| Fig. 2. | *P. multicaudata* Kirby. ♂, under side, Park City, Utah, July 10, 1901 | 23 |
| Fig. 3. | *P. eurymedon* Luc. ♂, Big Santa Anita Canyon, Los Angeles Co. Cal. May 5, 1924 | 24 |
| Fig. 4. | *P. eurymedon* Luc. ♀, San Antonio Canyon, L. A. Co. Cal. May 10, 1924 | 24 |
| Fig. 5. | *P. eurymedon* Luc. ♂, under side, Arroyo Seco, Los Angeles, Cal. May 4, 1916 | 24 |
| Fig. 6. | *P. rutulus* Luc. ♂, Sycamore Grove, Los Angeles, Cal. March 15, 1924 | 22 |
| Fig. 7. | *P. rutulus* Luc. ♀, Sycamore Grove, Los Angeles, Cal. March 11, 1922 | 22 |
| Fig. 8. | *P. rutulus* Luc. ♂, under side, Sycamore Grove, Los Angeles, Cal. March 16, 1924 | 22 |



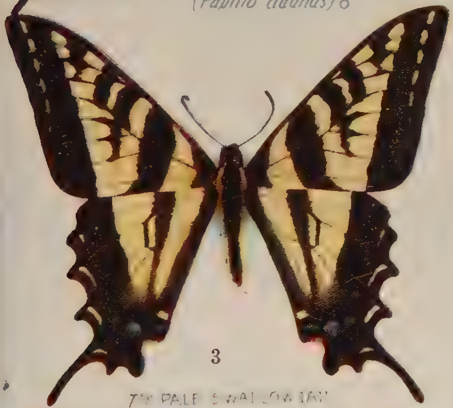
1

The DAUNUS SWALLOWTAIL
(*Papilio daunus*) ♂



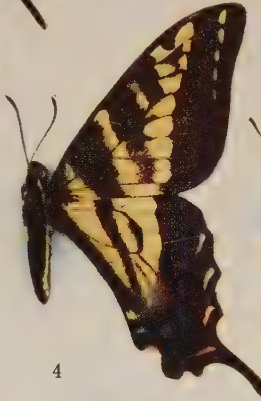
2

The DAUNUS SWALLOWTAIL
(*P. daunus*) under side



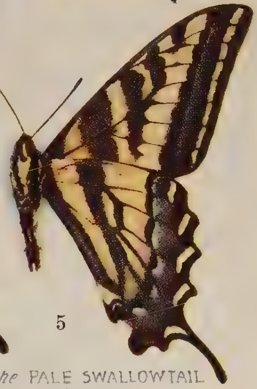
3

The PALE SWALLOWTAIL
(*Papilio eurymedon*) ♂



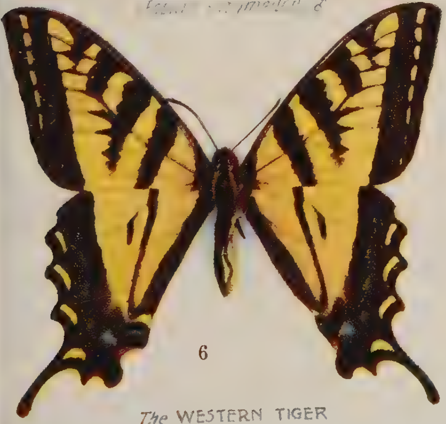
4

The PALE SWALLOWTAIL
(*Papilio eurymedon*) ♀



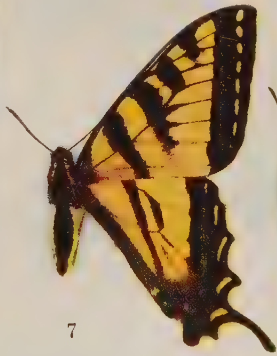
5

The PALE SWALLOWTAIL
Under side



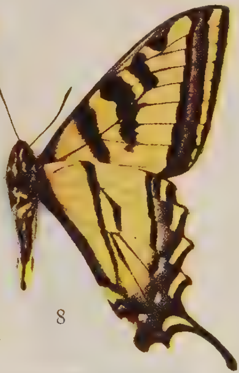
6

The WESTERN TIGER
SWALLOWTAIL (*P. rutulus*) ♂



7

The WESTERN TIGER
SWALLOWTAIL (*P. rutulus*) ♀



8

The WESTERN TIGER
SWALLOWTAIL Under side

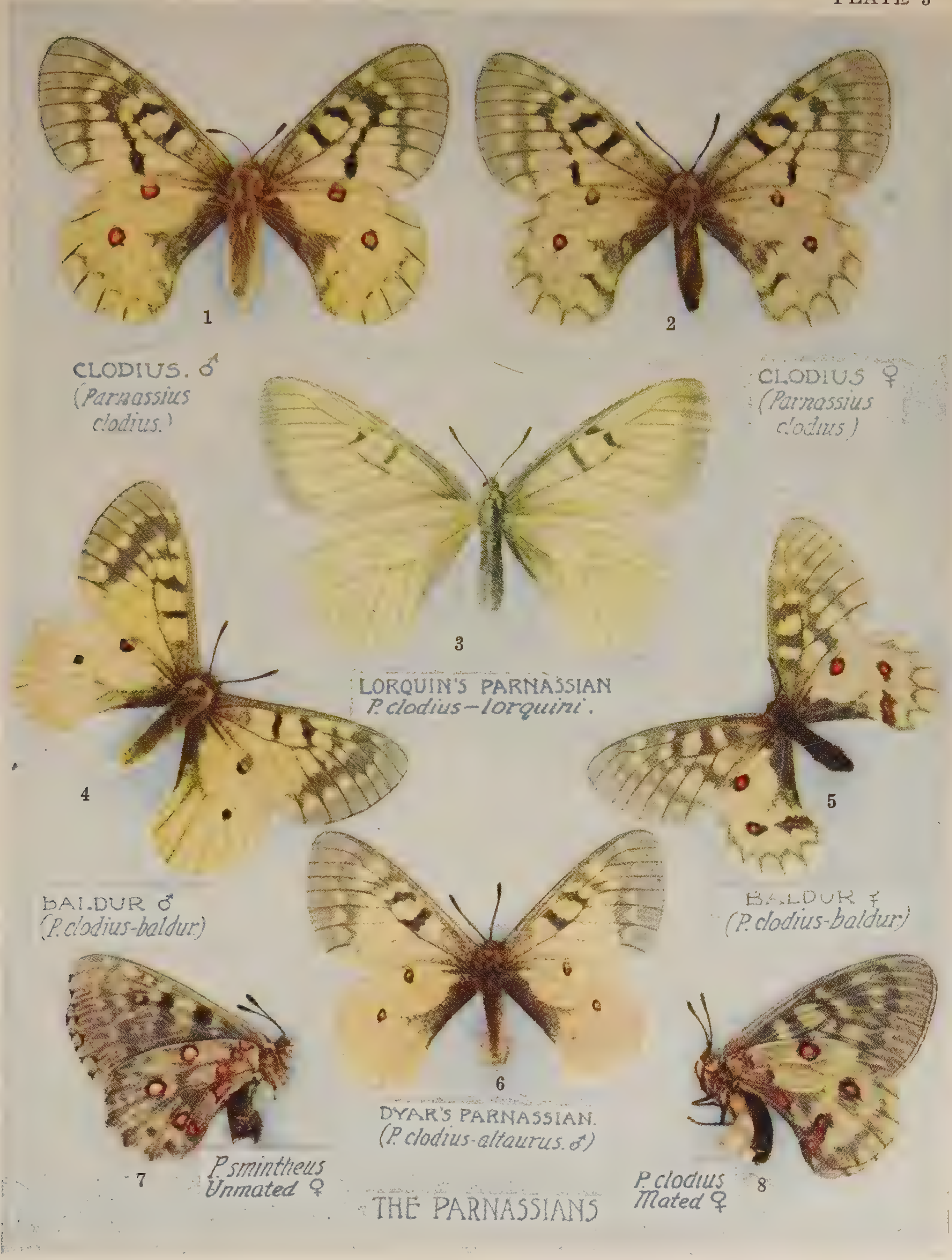
The SWALLOWTAILS

All figures reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 5

| | | Text Page |
|---|---|---|
| Fig. 1. | *Parnassius clodius claudianus* Stich. ♂, Goldstream, B. C., Canada, June 27, 1902 | 25 |
| Fig. 2. | *P. clodius claudianus* Stich. ♀, Goldstream, B. C., Canada, June 27, 1902 | 25 |
| Fig. 3. | *P. clodius baldur* ab. *lorquini* Oberth. from illustration, Oberthur's "Etudes" of April, 1891, Pl. 2., fig. 17 | 26 |
| Fig. 4. | *P. clodius baldur* Edw. ♂, Yosemite Valley, Cal., July | 26 |
| Fig. 5. | *P. clodius baldur* Edw. ♀, Mt. Tallac nr. Lake Tahoe, Cal., Aug. 12, 1907 | 26 |
| Fig. 6. | *P. clodius* ab. *altaurus* Dyar ♂, Bear Valley, Marin Co., Cal., May 20, 1920 | 25 |
| Fig. 7. | *P. smintheus* Dbldy. & Hew. ♀, under side, So. Park, Colo., July, 1902 | 27 |
| Fig. 8. | *P. clodius baldur* Edw. ♀, under side, Yosemite, Cal., July, 1922 | 26 |


1
2
CLODIUS. ♂
(Parnassius
clodius.)
CLODIUS ♀
(Parnassius
clodius)
3
LORQUIN'S PARNASSIAN
P. clodius—lorquini.
4
5
BALDUR ♂
(P. clodius-baldur)
BALDUR ♀
(P. clodius-baldur)
6
DYAR'S PARNASSIAN.
(P. clodius-altaurus. ♂)
7
P. smintheus
Unmated ♀
P. clodius
Mated ♀
8

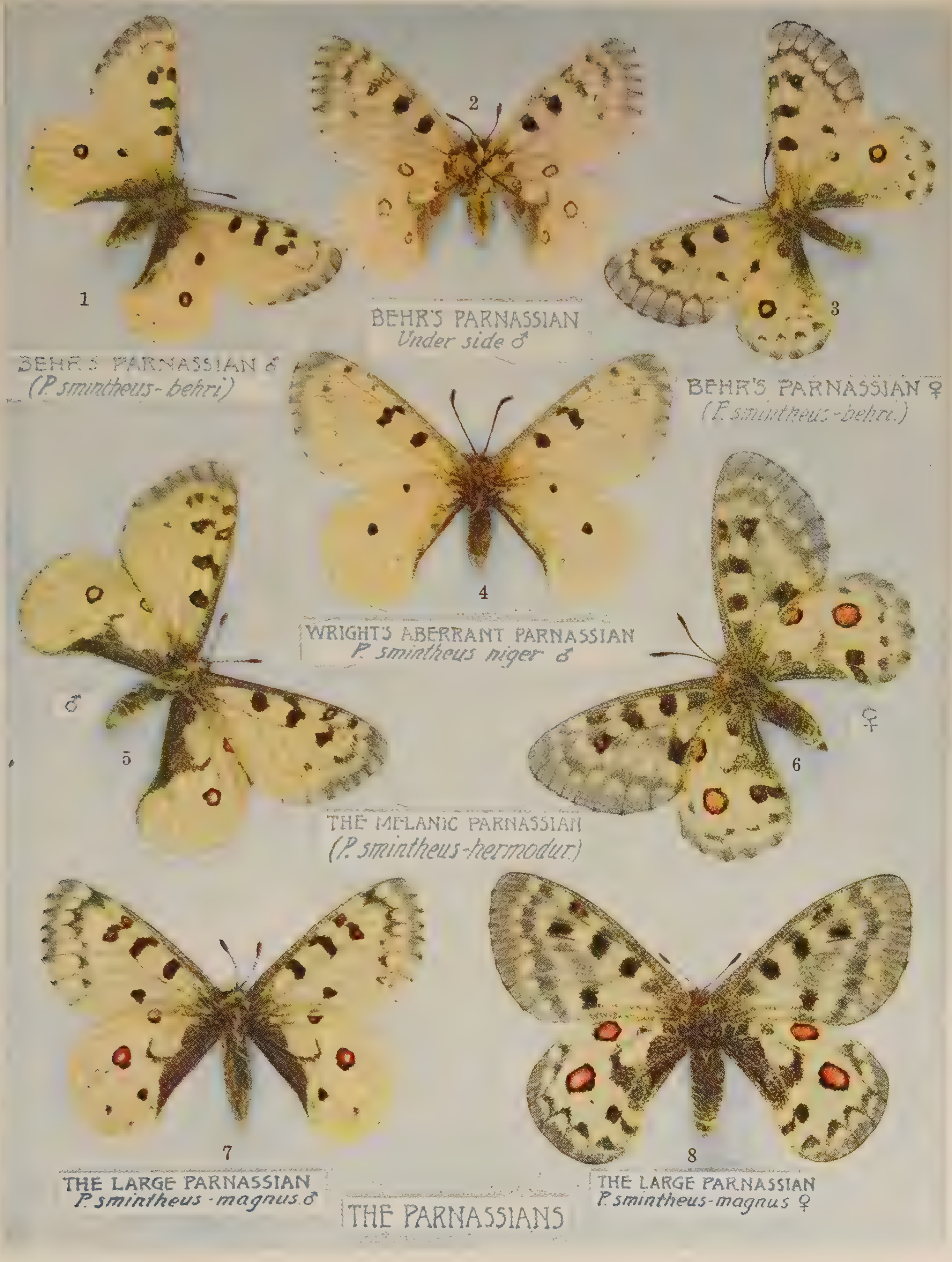
THE PARNASSIANS

All figures slightly reduced

Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 6

| | | Text Page |
|---|---|---|
| Fig. 1. | *Parnassius smintheus behrii* Edw. ♂. Summit, Cal. No. date | 27 |
| Fig. 2. | *P. smintheus behrii* ♂, under side, Ward Peak, Placer Co. Cal. July 29, 1909 | 27 |
| Fig. 3. | *P. smintheus behrii* Edw. ♀. Deer Park, Placer Co., Cal. July 4, 1909 | 27 |
| Fig. 4. | *P. smintheus behrii* ab. *niger* Wright. ♂. Wallace, Idaho. June 28, 1919 | 27 |
| Fig. 5. | *P. smintheus hermodur* Hy. Edw. ♂. Hall Valley, Colo. July, 1902 | 27 |
| Fig. 6. | *P. smintheus hermodur* Hy. Edw. ♀. Hall Valley, Colo. July, 1902 | 27 |
| Fig. 7. | *P. smintheus magnus* Wright ♂. Near Lillooet, B. C., Canada. Aug., 1915 | 27 |
| Fig. 8. | *P. smintheus magnus* Wright ♀. Near Lillooet, B. C., Canada. Aug. 30, 1917 | 27 |

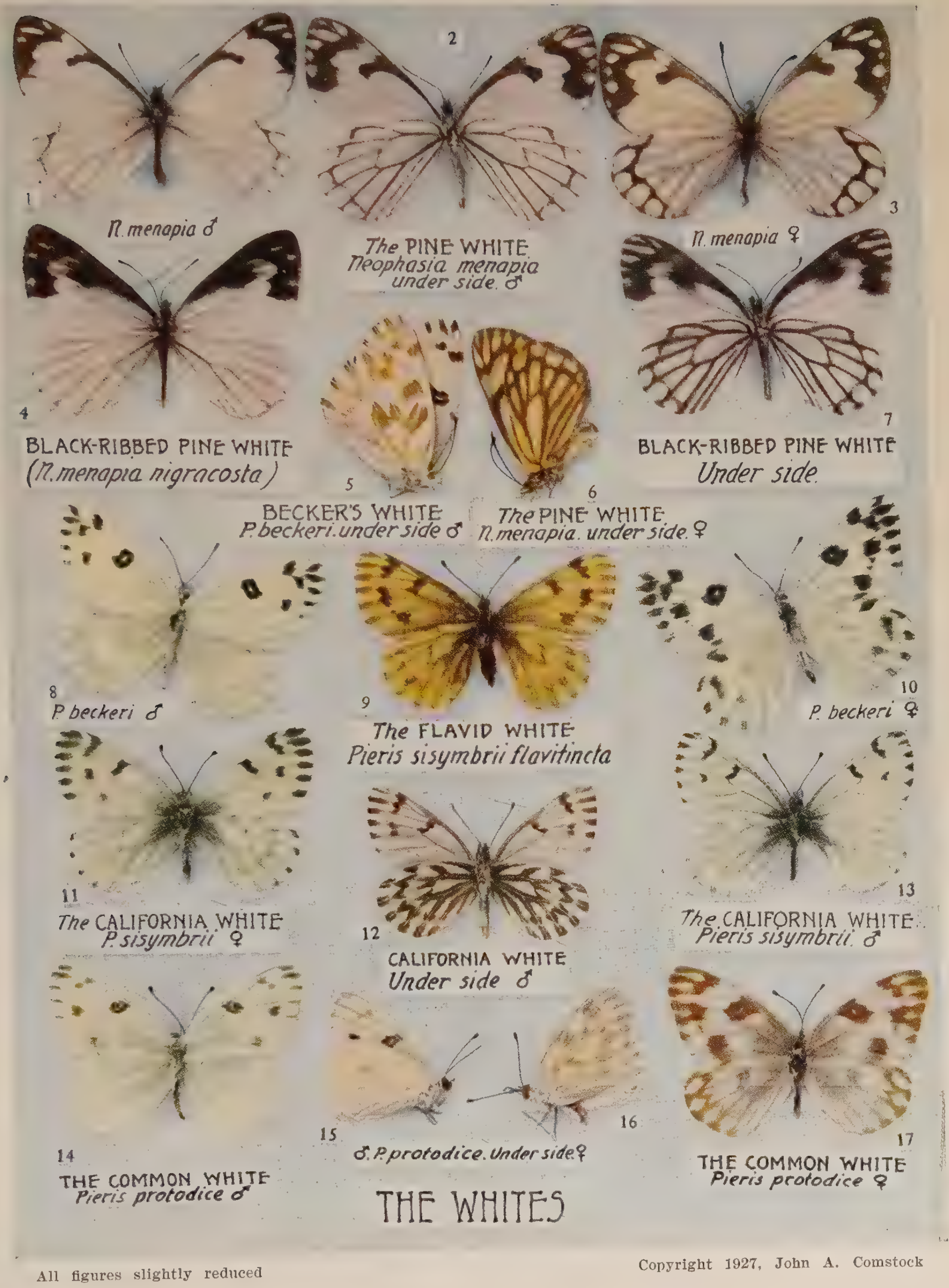

1
2
3
BEHR'S PARNASSIAN
Under side ♂
BEHR'S PARNASSIAN ♂
(P. smintheus-behri)
BEHR'S PARNASSIAN ♀
(P. smintheus-behri.)
4
WRIGHT'S ABERRANT PARNASSIAN
P. smintheus niger ♂
♂
5
♀
6
THE MELANIC PARNASSIAN
(P. smintheus-hermodur.)
7
8
THE LARGE PARNASSIAN
P. smintheus-magnus ♂
THE PARNASSIANS
THE LARGE PARNASSIAN
P. smintheus-magnus ♀

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 7

| | | Text Page |
|---|---|---|
| Fig. 1. | *Neophasia menapia* F. & F. ♂, Columbia Falls, Mont. Aug., 1902 | 28 |
| Fig. 2. | *N. menapia* F. & F. ♂, under side, Monache Meadows, Tulare Co., Cal. Aug. 7, 1917 | 28 |
| Fig. 3. | *N. menapia* F. & F. ♀, Monache Meadows, Tulare Co., Cal. Aug. 7, 1917 | 28 |
| Fig. 4. | *N. menapia* ab. *nigracosta* Comst. ♂, (type) Monache Meadows, Tulare Co., Cal. Aug. 20, 1917 | 29 |
| Fig. 5. | *Pieris beckerii* Edw. ♂, under side, Tehachapi, Cal. July 2, 1918 | 29 |
| Fig. 6. | *Neophasia menapia* F. & F. ♀, under side, Monache Meadows, Tulare Co. Cal. Aug. 7, 1917 | 28 |
| Fig. 7. | *N. menapia* ab. *nigracosta* Comst. ♂ (paratype) under side, Monache Meadows, Tulare Co. Cal. Aug. 25, 1917 | 29 |
| Fig. 8. | *Pieris beckerii* Edw. ♂, Tehachapi, Cal., July 2, 1918 | 29 |
| Fig. 9. | *P. sisymbrii flavitincta* Comst. ♀, (type) Cranbrook, B. C., Canada. April 30, 1911 | 31 |
| Fig. 10. | *P. beckerii* Edw. ♀, Tehachapi, Cal. July 2, 1918 | 29 |
| Fig. 11. | *P. sisymbrii* Bdv. ♀, Mammoth Camp, Mono Co. June 8, 1922 | 30 |
| Fig. 12. | *P. sisymbrii* Bdv. ♂, under side, Mammoth Camp, Mono Co. Cal. June 10, 1922 | 30 |
| Fig. 13. | *P. sisymbrii* Bdv. ♂, Mammoth Camp, Mono Co. Cal. June 10, 1922 | 30 |
| Fig. 14. | *P. protodice* Bdv. & Lec. ♂, Los Angeles, Cal. May, 1918. | 31 |
| Fig. 15. | *P. protodice* Bdv. & Lec. ♂, under side, Los Angeles, Cal. May 20, 1922 | 31 |
| Fig. 16. | *P. protodice* Bdv. & Lec. ♀, under side, Los Angeles, Cal. May 20, 1922 | 31 |
| Fig. 17. | *P. protodice* Bdv. & Lec. ♀, Los Angeles, Cal., Aug. 10, 1924 | 31 |


1
N. menapia ♂
2
The PINE WHITE
Neophasia menapia
under side. ♂
3
N. menapia ♀
4
BLACK-RIBBED PINE WHITE
(N. menapia nigracosta)
5
BECKER'S WHITE
P. beckeri. under side ♂
6
The PINE WHITE
N. menapia. under side. ♀
7
BLACK-RIBBED PINE WHITE
Under side
8
P. beckeri ♂
9
The FLAVID WHITE
Pieris sisymbrii flavitincta
10
P. beckeri ♀
11
The CALIFORNIA WHITE
P. sisymbrii ♀
12
CALIFORNIA WHITE
Under side ♂
13
The CALIFORNIA WHITE
Pieris sisymbrii ♂
14
THE COMMON WHITE
Pieris protodice ♂
15
16
♂. P. protodice. Under side ♀
17
THE COMMON WHITE
Pieris protodice ♀

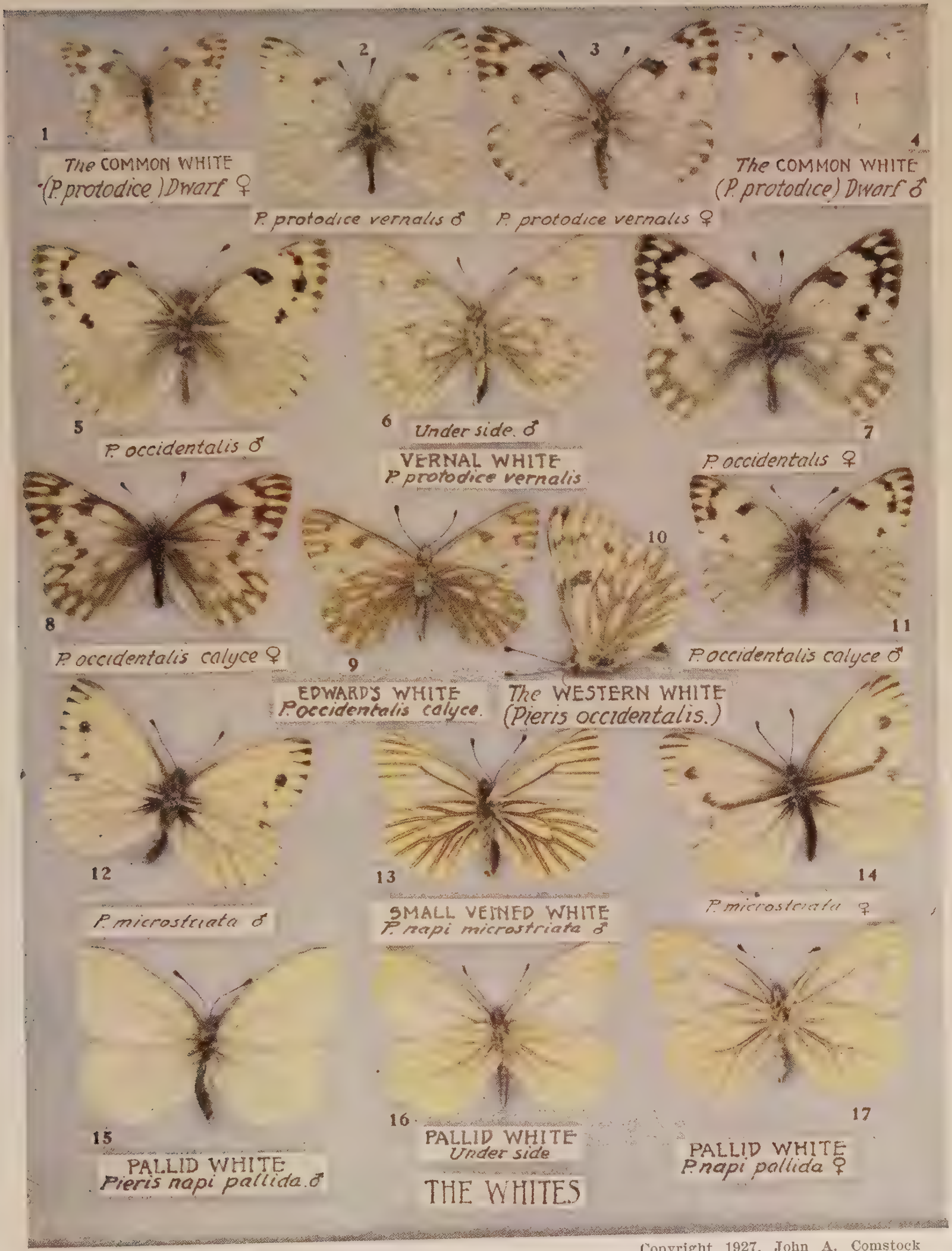
THE WHITES

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 8

| | | Text Page |
|---|---|---|
| Fig. 1. | *Pieris protodice* Bdv. & Lec. ♀, dwarfed. Los Angeles, Cal. Sept., 1919 | 31 |
| Fig. 2. | *P. protodice vernalis* Edw. ♂. Los Angeles, Cal. Feb. 20, 1923 | 32 |
| Fig. 3. | *P. protodice vernalis* Edw. ♀. Los Angeles, Cal. March 5, 1923 | 32 |
| Fig. 4. | *P. protodice* Bdv. & Lec. ♂. Los Angeles, Cal. Sept. 6, 1922 | 31 |
| Fig. 5. | *P. occidentalis* Reak. ♂. Blue River, Colo. July 30, 1902 | 32 |
| Fig. 6. | *P. protodice vernalis* Edw. ♂, under side. Los Angeles, Cal. Feb. 20, 1923 | 32 |
| Fig. 7. | *P. occidentalis* Reak. ♀. Blue River, Colo. July 30, 1902 | 32 |
| Fig. 8. | *P. occidentalis calyce* Edw. ♀. So. Park, Colo. June, 1918. | 33 |
| Fig. 9. | *P. occidentalis calyce* Edw. ♂, under side, So. Park, Colo. June, 1918 | 33 |
| Fig. 10. | *P. occidentalis* Reak. ♂, under side. Hall Valley, Colo. July, 1902 | 32 |
| Fig. 11. | *P. occidentalis calyce* Edw. ♂. So. Park, Colo. June, 1918. | 33 |
| Fig. 12. | *P. napi microstriata* Comst. ♂. Eldredge, Sonoma Co. Cal. March 13, 1911. (Holotype) | 34 |
| Fig. 13. | *P. napi microstriata* Comst. ♂, under side. Eldredge, Sonoma Co. Cal. March 13, 1911. Paratype | 34 |
| Fig. 14. | *P. napi microstriata* Comst. ♀. Eldredge, Sonoma Co. Cal. March 13, 1911. Allotype | 34 |
| Fig. 15. | *P. napi pallida* Scud. ♂. Bear Valley, Marin Co. Cal. May 28, 1916 | 33 |
| Fig. 16. | *P. napi pallida* Scud. ♂, under side. Martina, Mont. July 14 | 33 |
| Fig. 17. | *P. napi pallida* Scud. ♀, under side. Bear Valley, Marin Co. Cal. April 13, 1919 | 33 |

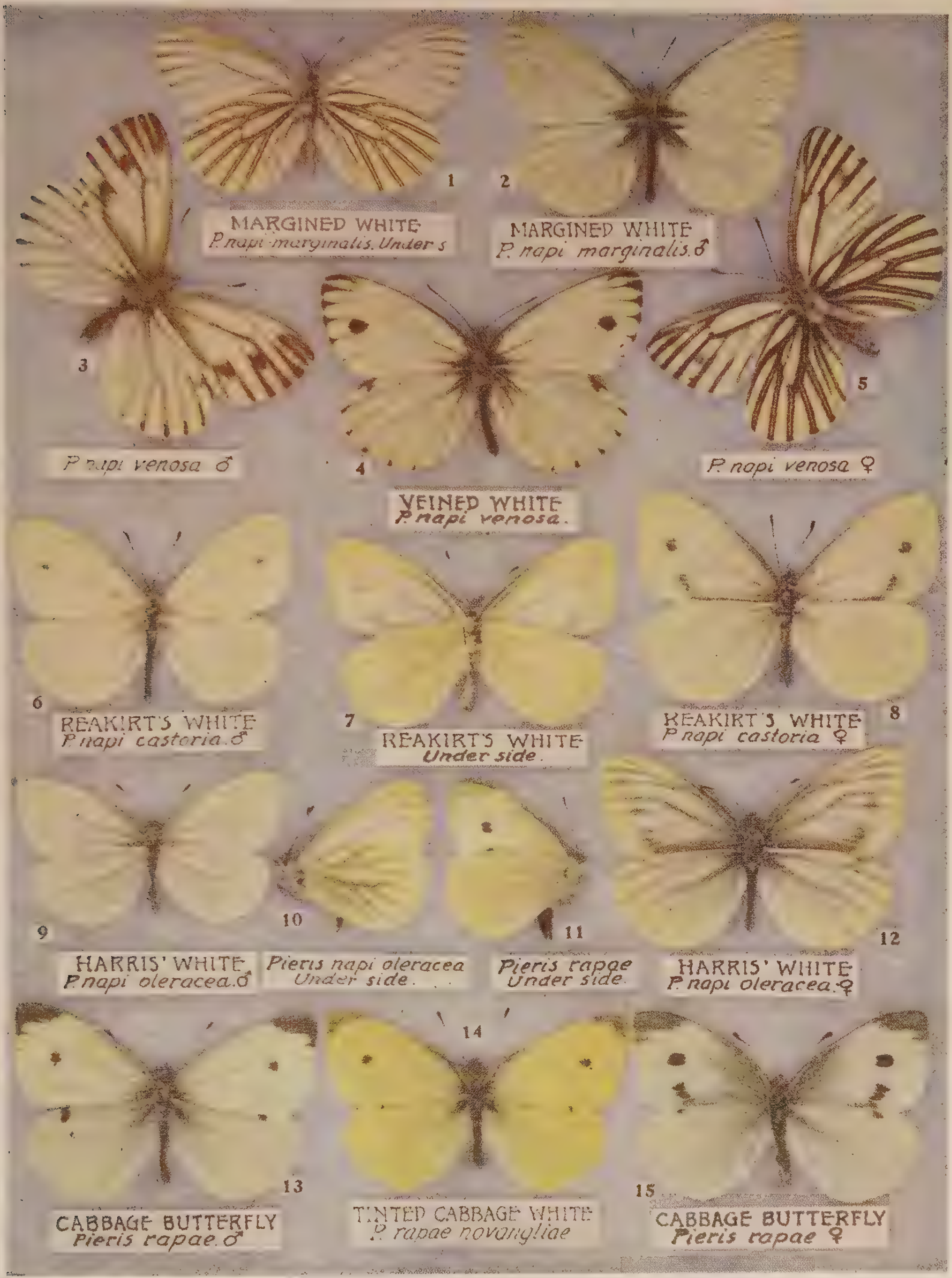

1
2
3
4
The COMMON WHITE (P. protodice) Dwarf ♀
P. protodice vernalis ♂
P. protodice vernalis ♀
The COMMON WHITE (P. protodice) Dwarf ♂
5
P. occidentalis ♂
6
Under side. ♂
VERNAL WHITE
P. protodice vernalis
7
P. occidentalis ♀
8
P. occidentalis calyce ♀
9
EDWARD'S WHITE
P. occidentalis calyce.
10
The WESTERN WHITE
(Pieris occidentalis.)
11
P. occidentalis calyce ♂
12
P. microstriata ♂
13
SMALL VEINED WHITE
P. napi microstriata ♂
14
P. microstriata ♀
15
PALLID WHITE
Pieris napi pallida ♂
16
PALLID WHITE
Under side
17
PALLID WHITE
P. napi pallida ♀
THE WHITES

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 9

|  |  | Text Page |
|---|---|---|
| Fig. 1. | *Pieris napi marginalis* Scud. ♂, under side, Portland, Ore. No date | 34 |
| Fig. 2. | *P. napi marginalis* Scud. ♂, Oregon. No date | 34 |
| Fig. 3. | *P. napi venosa* Scud. ♀, (This was erroneously marked ♂ on the plate). Pacific Grove, Cal. Feb., 1906 | 34 |
| Fig. 4. | *P. napi venosa* Scud. ♂, Pacific Grove, Cal. Feb., 1906 | 34 |
| Fig. 5. | *P. napi venosa* Scud. ♂, under side, (This was erroneously marked ♀ on the plate). Pacific Grove, Cal. Feb., 1906. | 34 |
| Fig. 6. | *P. napi castoria* Reak. ♂, Bear Valley, Marin Co. Cal. May 28, 1916 | 34 |
| Fig. 7. | *P. napi castoria* Reak. ♂, under side, Oregon. July 29, 1919 | 34 |
| Fig. 8. | *P. napi castoria* Reak. ♀, Oregon, July 21, 1919 | 34 |
| Fig. 9. | *P. napi oleracea* Harr. ♂, Piquitenay River, Hudson Bay R. R. No date | 34 |
| Fig. 10. | *P. napi oleracea* Harr. ♂, under side, Ainsworth, B. C. Canada. May 29, 1903 | 34 |
| Fig. 11. | *P. rapæ yreka* Reak. ♂, under side, Los Angeles, Cal. May, 1918 | 35 |
| Fig. 12. | *P. napi oleracea* Harr. ♀, Plumas Co. Cal. Aug. 8 | 34 |
| Fig. 13. | *P. rapæ yreka* Reak. ♂, Los Angeles, Cal., June 29, 1920. | 35 |
| Fig. 14. | *P. rapæ novangliæ* Scud. ♂, Smith's Cove, Nova Scotia. No date. Courtesy Dr. Wm. Barnes | 36 |
| Fig. 15. | *P. rapæ yreka* Reak. ♀, Los Angeles, Cal., June 2, 1918 | 35 |

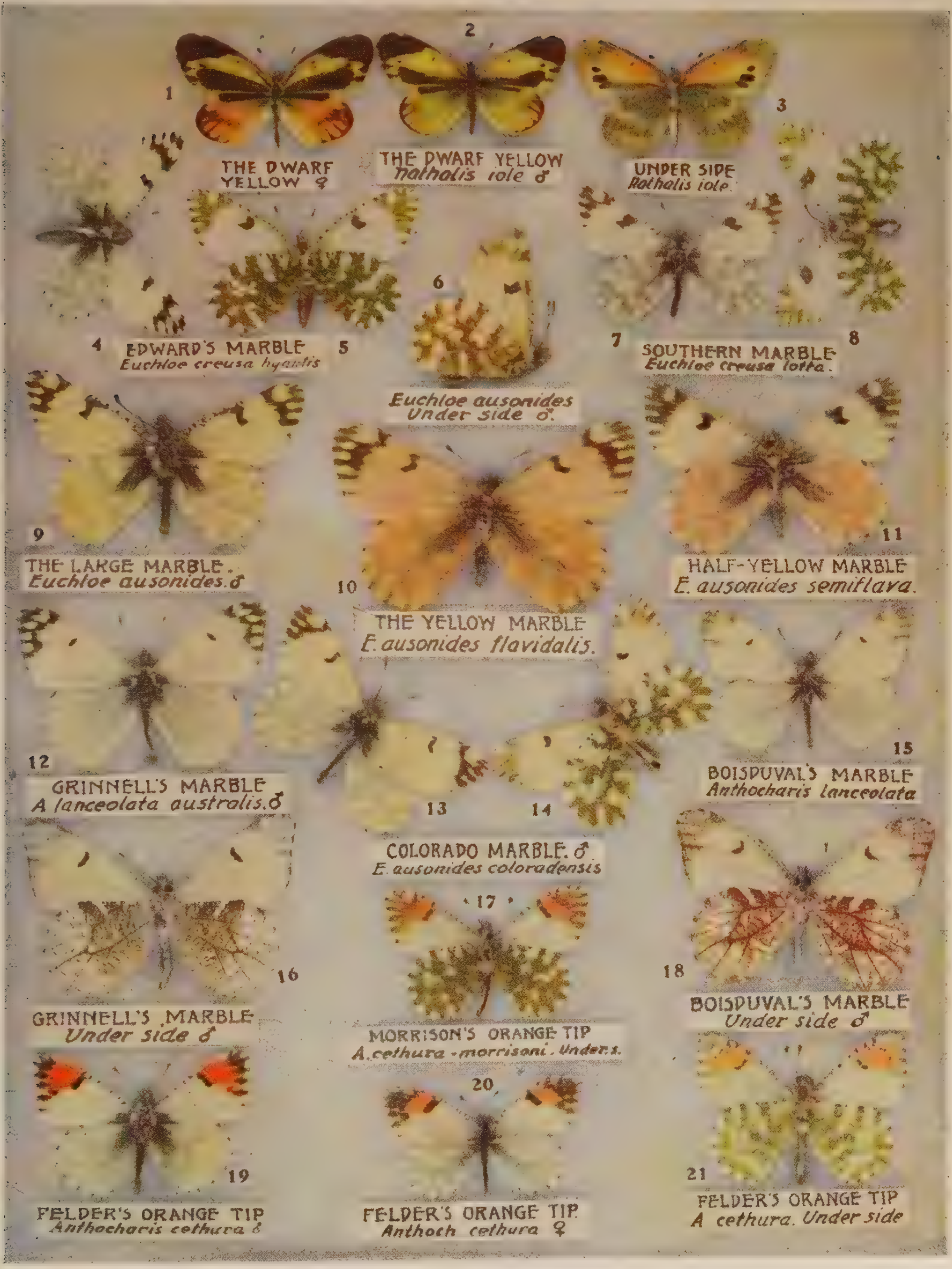

1
MARGINED WHITE
P. napi marginalis. Under s
2
MARGINED WHITE
P. napi marginalis ♂
3
P. napi venosa ♂
4
VEINED WHITE
P. napi venosa.
5
P. napi venosa ♀
6
REAKIRT'S WHITE
P. napi castoria ♂
7
REAKIRT'S WHITE
Under side.
8
REAKIRT'S WHITE
P. napi castoria ♀
9
HARRIS' WHITE
P. napi oleracea ♂
10
Pieris napi oleracea
Under side.
11
Pieris rapae
Under side.
12
HARRIS' WHITE
P. napi oleracea ♀
13
CABBAGE BUTTERFLY
Pieris rapae ♂
14
TINTED CABBAGE WHITE
P. rapae novangliae
15
CABBAGE BUTTERFLY
Pieris rapae ♀

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 10

| | | Text Page |
|---|---|---|
| Fig. 1. | *Nathalis iole* Bdv. ♀, Williams, Ariz. July 15, 1919 | 36 |
| Fig. 2. | *N. iole* Bdv. ♂, Flagstaff, Ariz. August 22, 1919 | 36 |
| Fig. 3. | *N. iole* Bdv. ♂, under side, Flagstaff, Ariz. August 12, 1919 | 36 |
| Fig. 4. | *Euchloe creusa hyantis* Edw. ♂, Port Columbia, Wash. May 12, 1916 | 37 |
| Fig. 5. | *E. creusa hyantis* Edw. ♂, under side, Port Columbia, Wash. April 16, 1916 | 37 |
| Fig. 6. | *E. ausonides* Bdv. ♂, under side, Palo Alto, Cal. April 12, 1914 | 38 |
| Fig. 7. | *E. creusa lotta* Beut. ♂, Little Mt., San Bernardino, Cal. March 15, 1914 | 37 |
| Fig. 8. | *E. creusa lotta* Beut. ♂, under side, Mint Canyon, Los Angeles Co., Cal. April 10, 1920 | 37 |
| Fig. 9. | *E. ausonides* Bdv. ♂, Palo Alto, Cal. April 12, 1914 | 38 |
| Fig. 10. | *E. ausonides flavidalis* Comst. ♀, Palo Alto, Cal. May 23, 1905. Type | 38 |
| Fig. 11. | *E. ausonides semiflava* Comst. ♀, San Jose Mission, Cal. April, 1919. Type | 38 |
| Fig. 12. | *Anthocharis lanceolata australis* Grin. ♂. Millard's Canyon, San Gabriel Mts., Cal. April 22, 1924 | 40 |
| Fig. 13. | *Euchloe ausonides coloradensis* Hy. Edw. ♂, South Park, Colo. July 12, 1902 | 39 |
| Fig. 14. | *E. ausonides coloradensis* Hy. Edw. ♂, under side, South Park, Colo. July 12, 1902 | 39 |
| Fig. 15. | *Anthocharis lanceolata* Bdv. ♂, Plumas Co., Cal. July, 1902 | 39 |
| Fig. 16. | *A. lanceolata australis* Grin. ♂, under side, Millard's Canyon, San Gabriel Mts., Cal. May 2, 1924. Compared with type | 40 |
| Fig. 17 | *A. cethura morrisoni* Edw. ♂, under side. Courtesy Drs. Barnes and McDunnough | 41 |
| Fig. 18. | *A. lanceolata* Bdv. ♂, under side, Plumas Co., Cal. July, 1902 | 39 |
| Fig. 19. | *A. cethura* F. & F. ♂, Little Mountain, San Bernardino, Cal. March 15, 1914 | 41 |
| Fig. 20. | *A. cethura* F. & F. ♀, Mint Canyon, Los Angeles Co., Cal. April 12, 1920 | 41 |
| Fig. 21. | *A. cethura* F. & F. ♂, under side, Little Mountain, San Bernardino, Cal. March 15, 1914 | 41 |

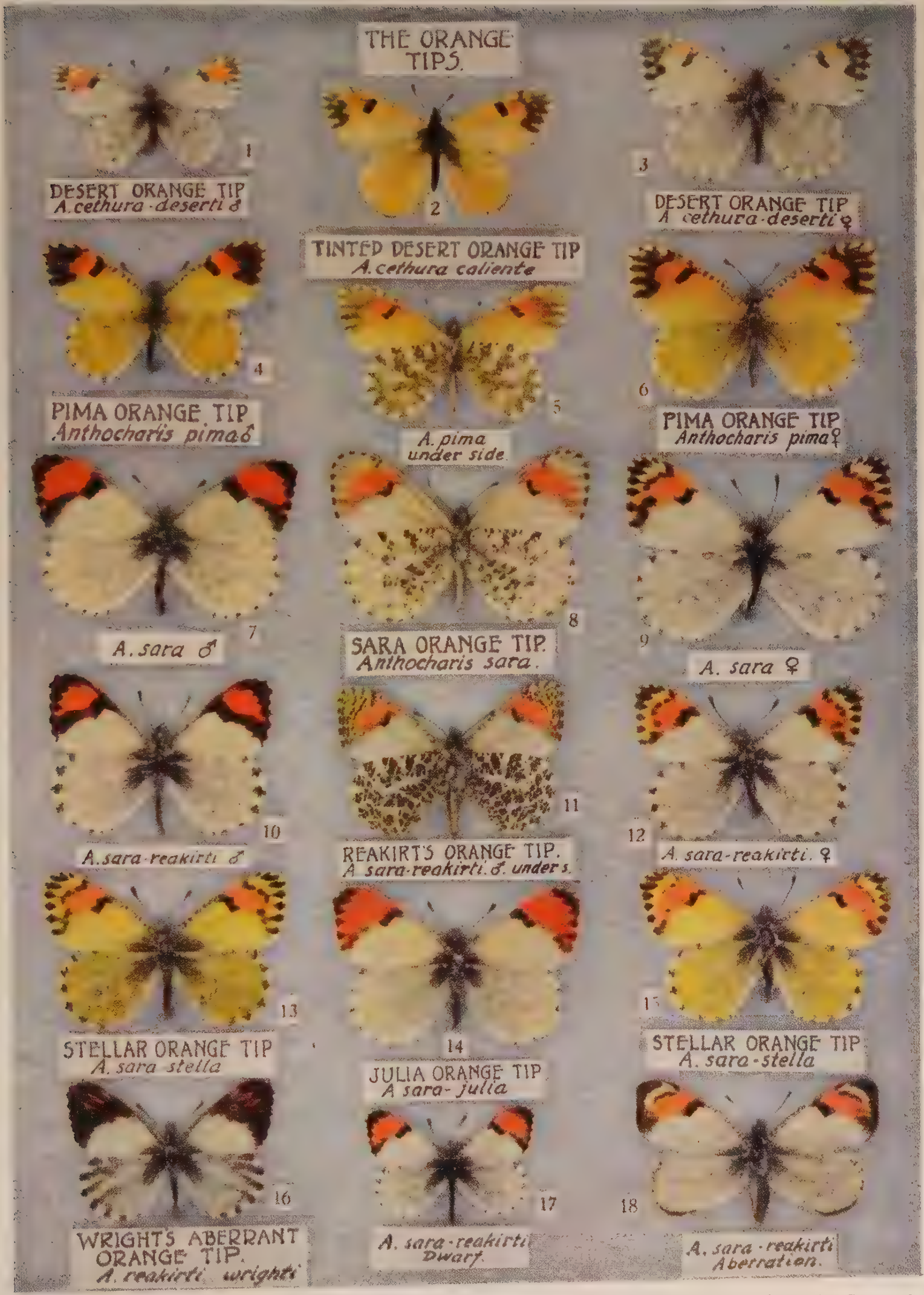

1
2
3
THE DWARF YELLOW ♀
THE DWARF YELLOW Nathalis iole ♂
UNDER SIDE Nathalis iole.
4
EDWARD'S MARBLE Euchloe creusa hyantis
5
6
7
SOUTHERN MARBLE Euchloe creusa lotta.
8
Euchloe ausonides Under side ♂.
9
THE LARGE MARBLE. Euchloe ausonides.♂
10
THE YELLOW MARBLE E. ausonides flavidalis.
11
HALF-YELLOW MARBLE E. ausonides semiflava.
12
GRINNELL'S MARBLE A lanceolata australis.♂
13
14
COLORADO MARBLE.♂ E. ausonides coloradensis
15
BOISDUVAL'S MARBLE Anthocharis lanceolata
16
GRINNELL'S MARBLE Under side ♂
17
MORRISON'S ORANGE TIP A. cethura-morrisoni. Under s.
18
BOISDUVAL'S MARBLE Under side ♂
19
FELDER'S ORANGE TIP Anthocharis cethura ♂
20
FELDER'S ORANGE TIP Anthoch cethura ♀
21
FELDER'S ORANGE TIP A cethura. Under side

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 11

| | | Text Page |
|---|---|---|
| Fig. 1. | *Anthocharis cethura deserti* Wright ♂, Slover, Cal. March 1, 1898 | 42 |
| Fig. 2. | *A. cethura caliente* Wright ♀, from Wright's illustration, "Butterflies of the West Coast" | 42 |
| Fig. 3. | *A. cethura deserti* Wright ♀, E. Riverside, Cal. April 5, 1897 | 42 |
| Fig. 4. | *A. pima* Edw. ♂, Phoenix Range, Ariz., March 1, 1916 | 42 |
| Fig. 5. | *A. pima* Edw. ♂ under side, Phoenix, Ariz., March 12, 1905 | 42 |
| Fig. 6. | *A. pima* Edw. ♀, Phoenix, Ariz. March 15, 1920 | 42 |
| Fig. 7. | *A. sara* Bdv. ♂, Los Angeles, Cal. June 5, 1918 | 42 |
| Fig. 8. | *A. sara* Bdv. ♂, under side, Los Angeles, Cal. May 28, 1922 | 42 |
| Fig. 9. | *A. sara* Bdv. ♀, Los Angeles, Cal., May 28, 1922 | 42 |
| Fig. 10. | *A. sara reakirtii* Edw. ♂, Los Angeles, Cal. Mch. 4, 1919. | 43 |
| Fig. 11. | *A. sara reakirtii* Edw. ♂, under side, Los Angeles, Cal. March 20, 1920 | 43 |
| Fig. 12. | *A. sara reakirtii* Edw. ♀, Palo Alto, Cal. April 8, 1903 | 43 |
| Fig. 13. | *A. sara stella* Edw. ♀, British Columbia, April | 43 |
| Fig. 14. | *A. sara julia* Edw. ♂, Lillooet, B. C., Canada. No date | 44 |
| Fig. 15. | *A. sara stella* Edw. ♀, So. Oregon. April, 1920 | 43 |
| Fig. 16. | *A. sara reakirtii* ab. *wrighti* Comst. ♂, Chula Vista, Cal. March 7, 1919. Type. Courtesy W. S. Wright | 44 |
| Fig. 17. | *A. sara reakirtii* Edw. ♂, dwarf. Los Angeles, Cal. March 4, 1919 | 43 |
| Fig. 18. | *A. sara reakirtii* Edw. ♀, aberration. No data. Courtesy Jean Gunder | 43 |

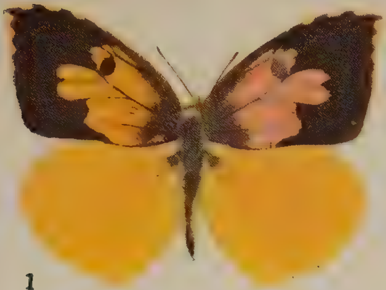

THE ORANGE TIPS.
1
2
3
DESERT ORANGE TIP
A. cethura-deserti ♂
DESERT ORANGE TIP
A. cethura-deserti ♀
TINTED DESERT ORANGE TIP
A. cethura caliente
4
5
6
PIMA ORANGE TIP
Anthocharis pima ♂
A. pima
under side.
PIMA ORANGE TIP
Anthocharis pima ♀
7
8
9
A. sara ♂
SARA ORANGE TIP.
Anthocharis sara.
A. sara ♀
10
11
12
A. sara-reakirti ♂
REAKIRT'S ORANGE TIP.
A. sara-reakirti. ♂. under s.
A. sara-reakirti. ♀
13
14
15
STELLAR ORANGE TIP
A. sara stella
JULIA ORANGE TIP
A sara-julia
STELLAR ORANGE TIP
A. sara-stella
16
17
18
WRIGHT'S ABERRANT ORANGE TIP.
A. reakirti wrighti
A. sara-reakirti
Dwarf.
A. sara-reakirti
Aberration.

All figures slightly reduced

Copyright 1927, John A. Comstock

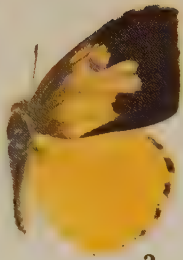
## EXPLANATION OF PLATE 12

| | | Text Page |
|---|---|---|
| Fig. 1. | *Zerene eurydice* Bdv. ♂, Saw Pit Canyon, Los Angeles Co. Cal. April, 1916 | 46 |
| Fig. 2. | *Z. eurydice* Bdv. ♂, intermediate form, San Bernardino Mts., Cal. No date | 46 |
| Fig. 3. | *Z. eurydice bernardino* Edw. ♂, San Bernardino Mts., Cal. No date | 47 |
| Fig. 4. | *Z. cæsonia rosa* M'Neill ♂, under side, Cochise Co. Ariz. Oct. 16, 1916 | 49 |
| Fig. 5. | *Z. eurydice* Bdv. ♀, San Bernardino Mts., Cal. April 17, 1918 | 46 |
| Fig. 6. | *Z. eurydice* Bdv. ♀, intermediate form, San Bernardino Mts., Cal. July 10, 1924 | 46 |
| Fig. 7. | *Z. eurydice amorphæ* Hy. Edw. ♀, Eagle Rock Park, Los Angeles, Cal. July 14, 1918 | 48 |
| Fig. 8. | *Z. eurydice* ab. *fanniæ* Gunder ♂, (type) San Bernardino Mts., Cal. July 6, 1922. Courtesy Jean Gunder | 48 |
| Fig. 9. | *Z. eurydice* Bdv. ♀, under side, Big Bear Valley, San Bernardino Co. Cal. July, 1915 | 46 |
| Fig. 10. | *Z. eurydice* ab. *newcombi* Gunder ♂, (type) San Bernardino Mts., Cal. No date. Courtesy Jean Gunder | 48 |
| Fig. 11. | *Z. cæsonia* Stoll ♂, Miami, Fla. Nov. 27, 1915 | 48 |
| Fig. 12. | *Z. cæsonia* Stoll ♂, under side, Beeville, Texas. Aug. 23, 1916 | 48 |
| Fig. 13. | *Z. cæsonia* Stoll ♀, Beeville, Texas. Aug. 23, 1916 | 48 |



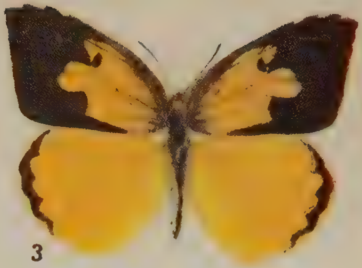
1

CALIFORNIA DOG-FACE
*Zerene eurydice* ♂



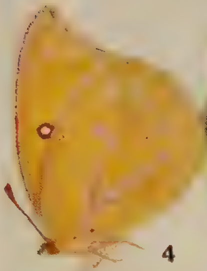
2

*Z. eurydice* ♂
*intermediate form*



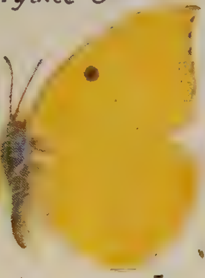
3

MARGINED DOG-FACE
*Z eurydice bernardino.*

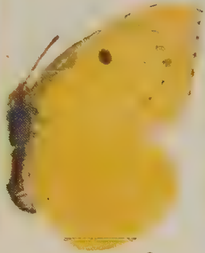


4

ROSEATE DOG FACE
*Z caesonia rosa*

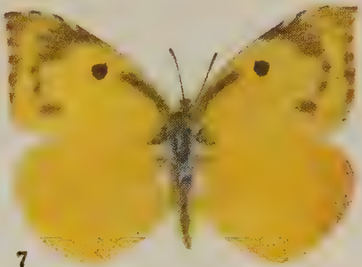


5



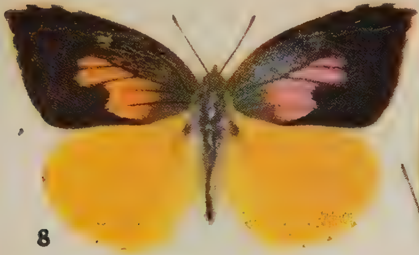
6

CALIFORNIA DOG-FACE
*Zerene eurydice* ♀



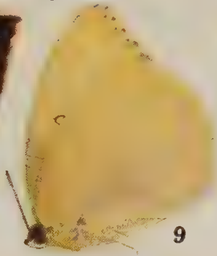
7

CLOUDED DOG-FACE
*Z eurydice amorphae.*



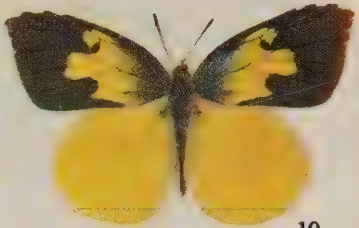
8

GUNDER'S ABERRANT
DOG-FACE *Z eurydice* $^{ab}$*fanniae*



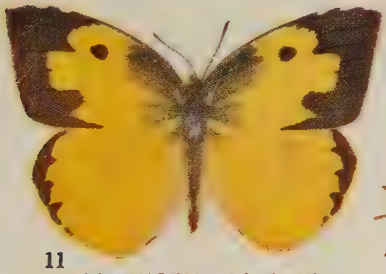
9

*Z. eurydice* ♀
*Under side*



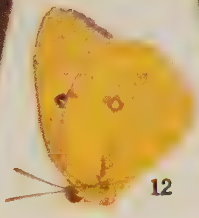
10

NEWCOMB'S ABERRANT
DOG-FACE *Z eurydice* $^{ab}$*newcombi* ♂



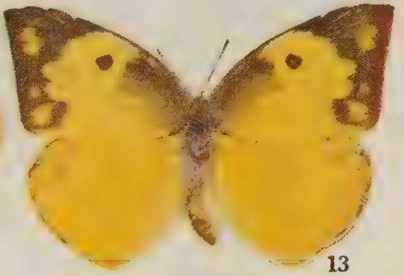
11

SOUTHERN DOG-FACE
*Zerene caesonia* ♂



12

*Z. caesonia* ♂
*Under side.*



13

SOUTHERN DOG-FACE
*Zerene caesonia* ♀

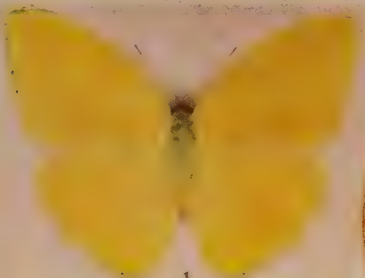
# THE DOG-FACES

All figures slightly reduced

Copyright 1927, John A. Comstock

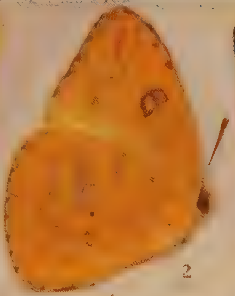
## EXPLANATION OF PLATE 13

| | | Text Page |
|---|---|---|
| Fig. 1. | *Catopsilia eubule sennæ* L. ♂, Los Angeles, Cal. Sept. 10, 1921 | 45 |
| Fig. 2. | *C. eubule sennæ* L. ♀, under side, Los Angeles, Cal. Oct. 1, 1919 | 45 |
| Fig. 3. | *C. eubule sennæ* L. ♀, Los Angeles, Cal. Dec. 10, 1917 | 45 |
| Fig. 4. | *C. eubule sennæ* L. ♀, Beeville, Texas. October 5, 1916 | 45 |
| Fig. 5. | *C. eubule sennæ* form *pallida* Ckll. ♀, Westlake Park, Los Angeles, Cal. Sept. 12, 1920. Courtesy Charles Ingham. | 46 |
| Fig. 6. | *Eurymus eurytheme* Bdv. ♂, Dallas, Texas. March. 14, 1914 | 49 |
| Fig. 7. | *E. eurytheme* Bdv. ♂, Griffith Park, Los Angeles, Cal. March 16, 1919 | 49 |
| Fig. 8. | *E. eurytheme* Bdv. ♂, under side, Los Angeles, Cal. March 20, 1918 | 49 |
| Fig. 9. | *E. eurytheme* Bdv. ♀, Santa Barbara, Cal. April 30, 1911 | 49 |
| Fig. 10. | *E. eurytheme* Bdv. ♀, Los Angeles, Cal. March 10, 1920 | 49 |
| Fig. 11. | *E. eurytheme* Bdv. ♀, under side, Oakland, Cal. June 10, 1916 | 49 |



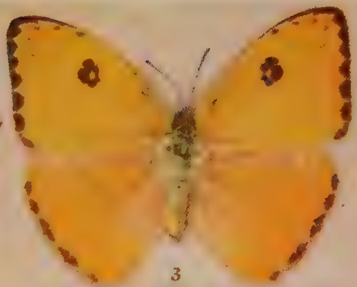
1

THE SENNA SULPHUR ♂
*Catopsilia eubule sennae L.*



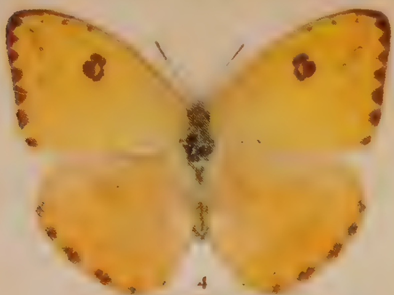
2

*Catopsilia eubule sennae. Under side.* ♀



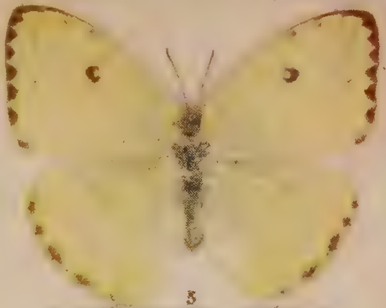
3

THE SENNA SULPHUR ♀
*Catopsilia eubule sennae. L.*



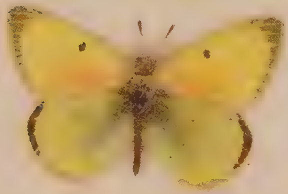
4

*C. eubule sennae. L.* ♀
*Intermediate form.*



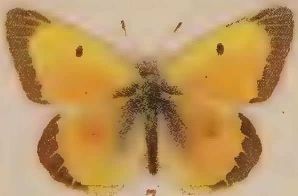
5

*C. eubule sennae. L.*
*Albinic ♀ pallida. Ckll.*



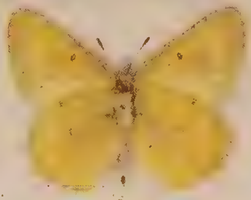
6

*E. eurytheme* ♂
*(atypical.)*



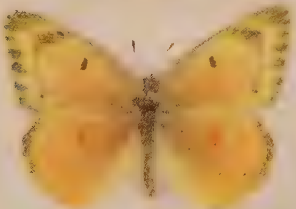
7

BOISDUVAL'S SULPHUR
*Eurymus eurytheme* ♂



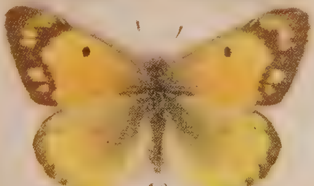
8

*E. eurytheme* ♂
*Under side.*



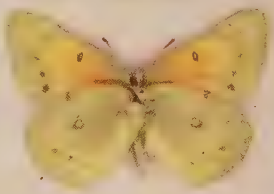
9

*Eurymus eurytheme* ♀



10

BOISDUVAL'S SULPHUR
*Eurymus eurytheme* ♀.



11

*E. eurytheme*
*Under side* ♀

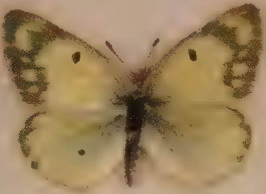
THE SULPHURS

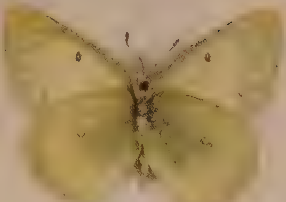
All figures slightly reduced

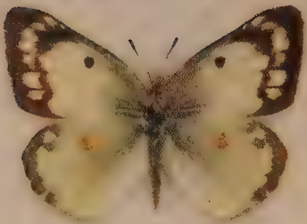
Copyright 1927, John A. Comstock

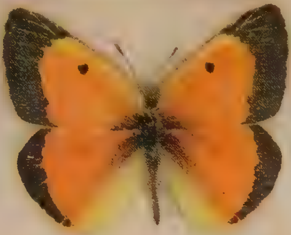
# EXPLANATION OF PLATE 14

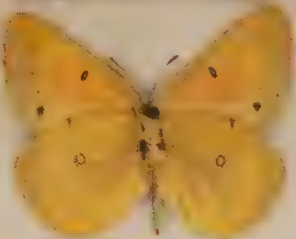
| | | Text Page |
|---|---|---|
| Fig. 1. | *Eurymus eurytheme* ab. *alba* Stkr. ♀, Kansas City, Mo., August 7, 1916 | 49 |
| Fig. 2. | *E. eurytheme* ab. *alba* Stkr. ♀, under side, Los Angeles, Cal. August 17, 1920 | 49 |
| Fig. 3. | *E. eurytheme amphidusa* ab. *alba* Stkr. ♀, Los Angeles, Cal. August 17, 1920 | 51 |
| Fig. 4. | *E. eurytheme amphidusa* Bdv. ♂, Monache Meadows, Tulare Co., Cal. August 20, 1917 | 51 |
| Fig. 5. | *E. eurytheme amphidusa* Bdv. ♂, under side, San Bernardino Mts., Cal. June 24, 1919 | 51 |
| Fig. 6. | *E. eurytheme amphidusa* Bdv. ♀, Monache Meadows, Tulare Co., Cal. August 3, 1917 | 51 |
| Fig. 7. | *E. eurytheme eriphyle* Edw. ♂, Longmont, Colo. July 11, 1918 | 51 |
| Fig. 8. | *E. eurytheme eriphyle* Edw. ♀; Longmont, Colo. July 11, 1918 | 51 |
| Fig. 9. | *E. eurytheme eriphyle* Edw. ♀, under side, Denver, Colo. August 14, 1918 | 51 |
| Fig. 10. | *E. eurytheme autumnalis* Ckll. ♂, Longmont, Colo. May 19, 1918 | 51 |
| Fig. 11. | *E. eurytheme autumnalis* Ckll. ♂, under side, Longmont, Colo. May 19, 1918 | 51 |
| Fig. 12. | *E. eurytheme autumnalis* Ckll. ♀, Longmont, Colo. May 19, 1918 | 51 |

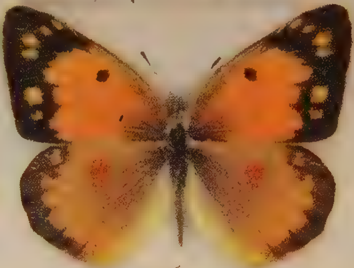

1
*Eurymus eurytheme*
*Albinic* ♀

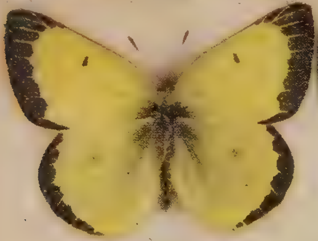

2
*E. eurytheme. Albinic* ♀
*Under side.*

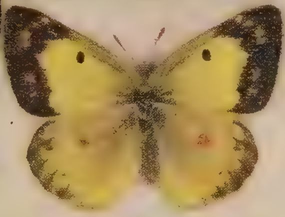

3
*E. eurytheme amphidusa*
*Albinic* ♀

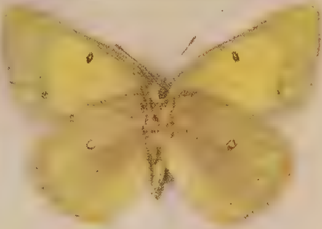

4
THE FLAVID SULPHUR
*E. eurytheme amphidusa* ♂

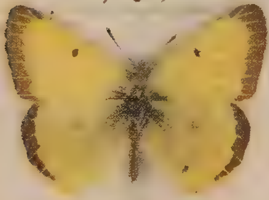

5
*E. eurytheme amphidusa*
*Under side.* ♂

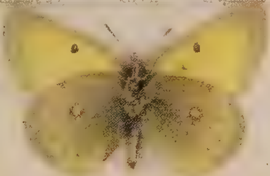

6
THE FLAVID SULPHUR
*E. eurytheme amphidusa* ♀

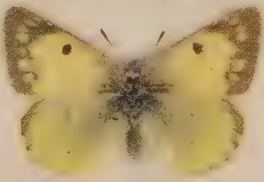

7
*E. eurytheme*
*eriphyle* ♂


8
THE YELLOW SULPHUR
*E. eurytheme eriphyle* ♀


9
*E. eurytheme eriphyle*
*Under side.* ♀


10
*E. eurytheme*
*autumnalis* ♂


11
COCKERELL'S SULPHUR
*E. eurytheme autumnalis.* ♂
*under s.*

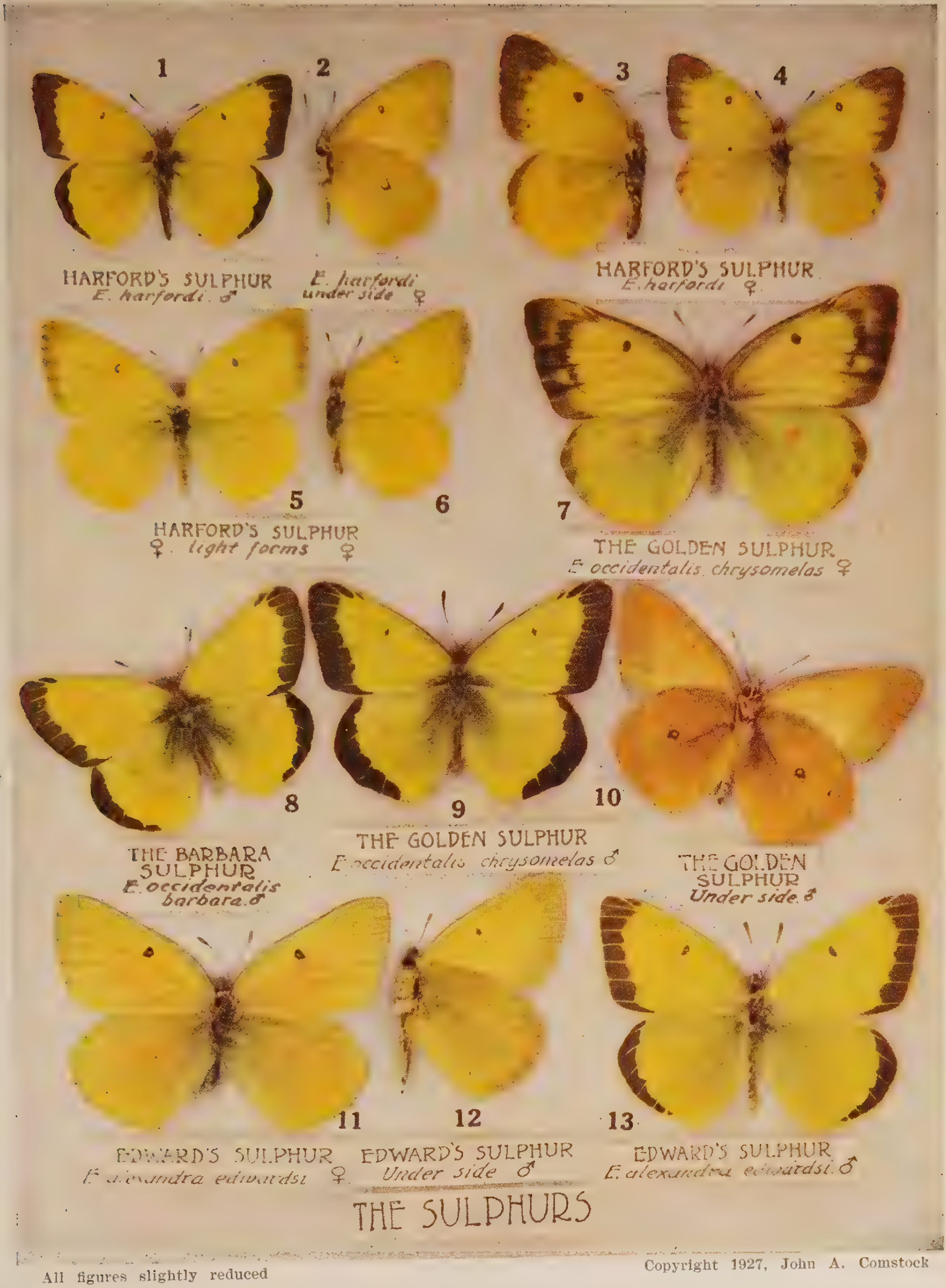

12
*E. eurytheme*
*autumnalis* ♀

## THE SULPHURS

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 15

| | | Text Page |
|---|---|---|
| Fig. 1. | *Eurymus harfordii* Hy. Edw. ♂, San Bernardino Mts., Cal. June 29, 1919 | 52 |
| Fig. 2. | *E. harfordii* Hy. Edw. ♀, under side, Tehachapi Mts., Cal. July 11, 1918 | 52 |
| Fig. 3. | *E. harfordii* Hy. Edw. ♀, San Bernardino Mts., Cal. June 29, 1919 | 52 |
| Fig. 4. | *E. harfordii* Hy. Edw. ♀, San Bernardino Mts., Cal., June 29, 1919 | 52 |
| Fig. 5. | *E. harfordii* Hy. Edw. ♀, San Bernardino Mts., Cal. June 29, 1919 | 52 |
| Fig. 6. | *E. harfordii* Hy. Edw. ♀, Tehachapi Mts., Cal., July 5, 1918 | 52 |
| Fig. 7. | *E. occidentalis chrysomelas* Hy. Edw. ♀, No. Calif. Courtesy Drs. Barnes and Benjamin | 52 |
| Fig. 8. | *E. occidentalis barbara* Hy. Edw. ♂, Santa Rosa, Cal. No date | 52 |
| Fig. 9. | *E. occidentalis chrysomelas* Hy. Edw. ♂, No. Calif. Courtesy Drs. Barnes and Benjamin | 52 |
| Fig. 10. | *E. occidentalis chrysomelas* ♂, under side, No. Calif. | 52 |
| Fig. 11. | *E. alexandra edwardsii* Edw. ♀, Wallace, Idaho, July 18, 1919 | 54 |
| Fig. 12. | *E. alexandra edwardsii* Edw. ♂, under side, Martina, Mont., July 10, 1906 | 54 |
| Fig. 13. | *E. alexandra edwardsii* Edw. ♀, Wallace, Idaho, July 20, 1918 | 54 |


1
2
3
4
HARFORD'S SULPHUR
E. harfordi. ♂
E. harfordi
under side ♀
HARFORD'S SULPHUR
E. harfordi ♀.
5
6
7
HARFORD'S SULPHUR
♀. light forms ♀
THE GOLDEN SULPHUR
E. occidentalis chrysomelas ♀
8
9
10
THE BARBARA
SULPHUR
E. occidentalis
barbara ♂
THE GOLDEN SULPHUR
E. occidentalis chrysomelas ♂
THE GOLDEN
SULPHUR
Under side ♂
11
12
13
EDWARD'S SULPHUR
E. alexandra edwardsi ♀
EDWARD'S SULPHUR
Under side ♂
EDWARD'S SULPHUR
E. alexandra edwardsi ♂

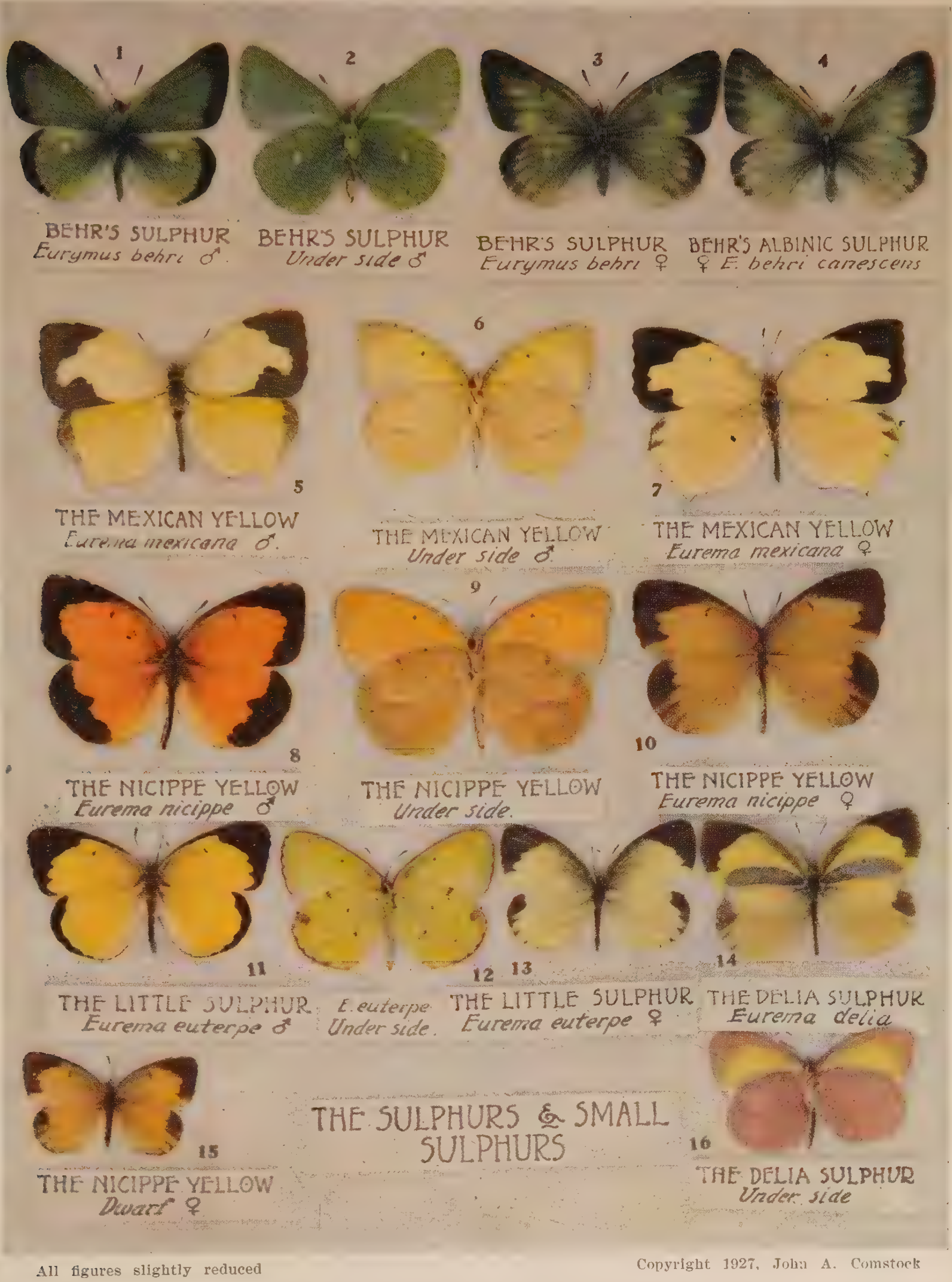
THE SULPHURS

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 16

| | | Text Page |
|---|---|---|
| Fig. 1. | *Eurymus behrii* Edw. ♂, Tioga Pass, Yosemite, Cal. August 4, 1922 | 54 |
| Fig. 2. | *E. behrii* Edw. ♂, under side, Tioga Pass, Yosemite, Cal. August 4, 1922 | 54 |
| Fig. 3. | *E. behrii* Edw. ♀, Tioga Pass, Yosemite, Cal. Aug. 4, 1922. | 54 |
| Fig. 4. | *E. behrii canescens* Comst. ♀, Tioga Pass, Yosemite, Cal. August 4, 1922. Type | 55 |
| Fig. 5. | *Eurema mexicana* Bdv. ♂, Chiricahua Mts., Cochise Co., Ariz. May 30, 1908 | 55 |
| Fig. 6. | *E. mexicana* Bdv. ♂, under side, Chiricahua Mts., Cochise Co., Ariz. June 6, 1908 | 55 |
| Fig. 7. | *E. mexicana* Bdv. ♀, Vera Cruz, Mexico. May, 1920 | 55 |
| Fig. 8. | *E. nicippe* Cram. ♂, Los Angeles, Cal. Nov. 15, 1920 | 56 |
| Fig. 9. | *E. nicippe* Cram. ♂, under side, Hot Springs, Ariz. October 15, 1918 | 56 |
| Fig. 10. | *E. nicippe* Cram. ♀, Hot Springs, Ariz. October 15, 1918. | 56 |
| Fig. 11. | *E. lisa* Bdv. & Lec. (synonym euterpe Men.) ♂, Waynesville, Mo. September 12, 1914 | 56 |
| Fig. 12. | *E. lisa* Bdv. & Lec. (synonym euterpe Men.) ♂, under side, Orlando, Fla. April 14, 1918 | 56 |
| Fig. 13. | *E. lisa* Bdv. & Lec. (synonym euterpe Men.) ♀, Southern Pines, No. Carolina. September 20, 1911 | 56 |
| Fig. 14. | *E. demoditas* Hbn. (synonym delia Cram.) ♀, Sweetwater, Fla. February 11, 1901 | 57 |
| Fig. 15. | *E. nicippe* Cram. ♀, dwarf. Santa Monica, Cal. June 17, 1915 | 56 |
| Fig. 16. | *E. demoditas* Hbn. (synonym delia Cram.) ♂, under side, St. Petersburg, Fla. February 15, 1920 | 57 |



1 BEHR'S SULPHUR *Eurymus behri* ♂

2 BEHR'S SULPHUR *Under side* ♂

3 BEHR'S SULPHUR *Eurymus behri* ♀

4 BEHR'S ALBINIC SULPHUR ♀ *E. behri canescens*

5 THE MEXICAN YELLOW *Eurema mexicana* ♂.

6 THE MEXICAN YELLOW *Under side* ♂.

7 THE MEXICAN YELLOW *Eurema mexicana* ♀

8 THE NICIPPE YELLOW *Eurema nicippe* ♂

9 THE NICIPPE YELLOW *Under side.*

10 THE NICIPPE YELLOW *Eurema nicippe* ♀

11 THE LITTLE SULPHUR *Eurema euterpe* ♂

12 *E. euterpe* *Under side.*

13 THE LITTLE SULPHUR *Eurema euterpe* ♀

14 THE DELIA SULPHUR *Eurema delia*

15 THE NICIPPE YELLOW *Dwarf* ♀

16 THE DELIA SULPHUR *Under side*

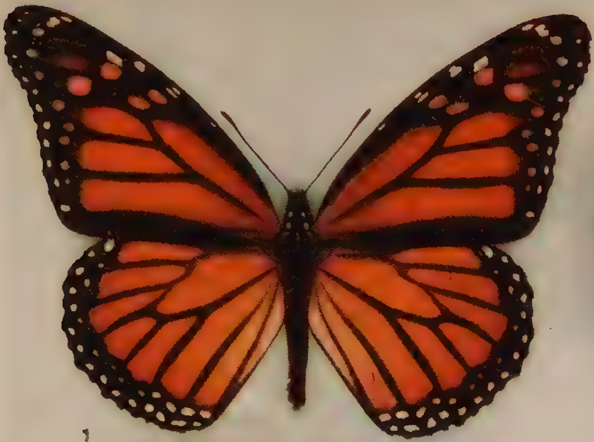
THE SULPHURS & SMALL SULPHURS

All figures slightly reduced

Copyright 1927, John A. Comstock

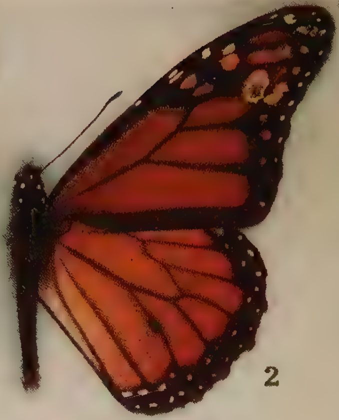
# EXPLANATION OF PLATE 17

| | | Text Page |
|---|---|---|
| Fig. 1. | *Danaus menippe* Hbn. (syn. archippus) ♀, Cochise Co., Ariz. Oct. 6, 1916 | 58 |
| Fig. 2. | *D. menippe* Hbn. ♂, Los Angeles, Cal., Oct. 15, 1920 | 58 |
| Fig. 3. | *D. menippe* ab. *fumosus* Hlst. ♀, Evanston, Ill. 1905 | 59 |
| Fig. 4. | *D. berenice strigosa* Bates ♀, Cochise Co., Ariz., Oct. 16. 1916. | 60 |
| Fig. 5. | *D. berenice strigosa* Bates ♀, under side, Los Angeles, Cal. July 23, 1910 | 60 |
| Fig. 6. | *D. berenice strigosa* ab. *kerri* Comst. ♂, Blythe, Cal. Oct. 28, 1921. Type. Courtesy L. T. Kerr | 60 |



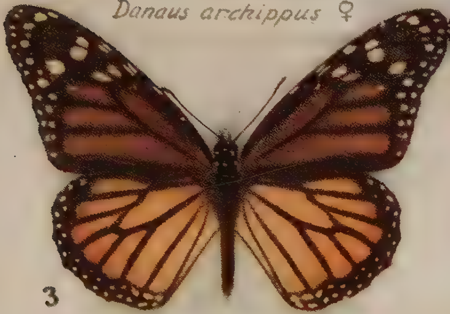
1

THE MONARCH
*Danaus archippus* ♀



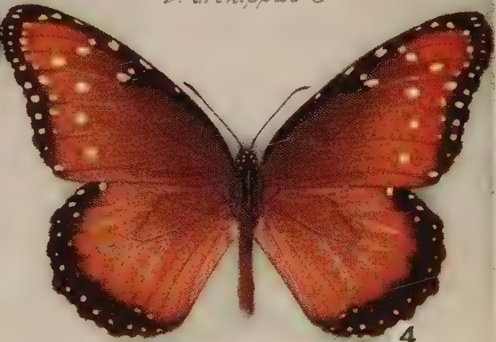
2

THE MONARCH
*D. archippus* ♂



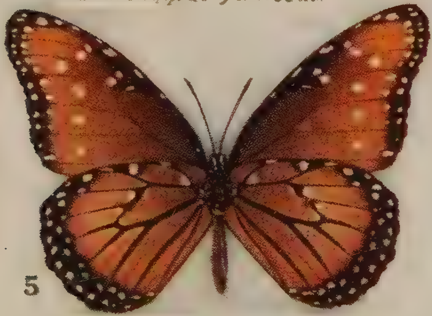
3

THE SMOKY MONARCH
*D. archippus fumosus.*



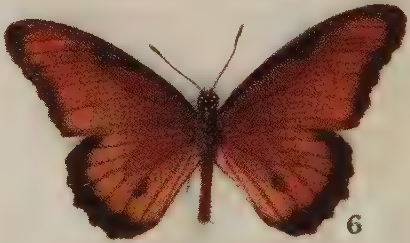
4

THE STRIATED QUEEN
*D. berenice strigosa* ♀



5

THE STRIATED QUEEN
*Under side*



6

KERR'S ABERRANT QUEEN
*D. berenice kerri.* ♂

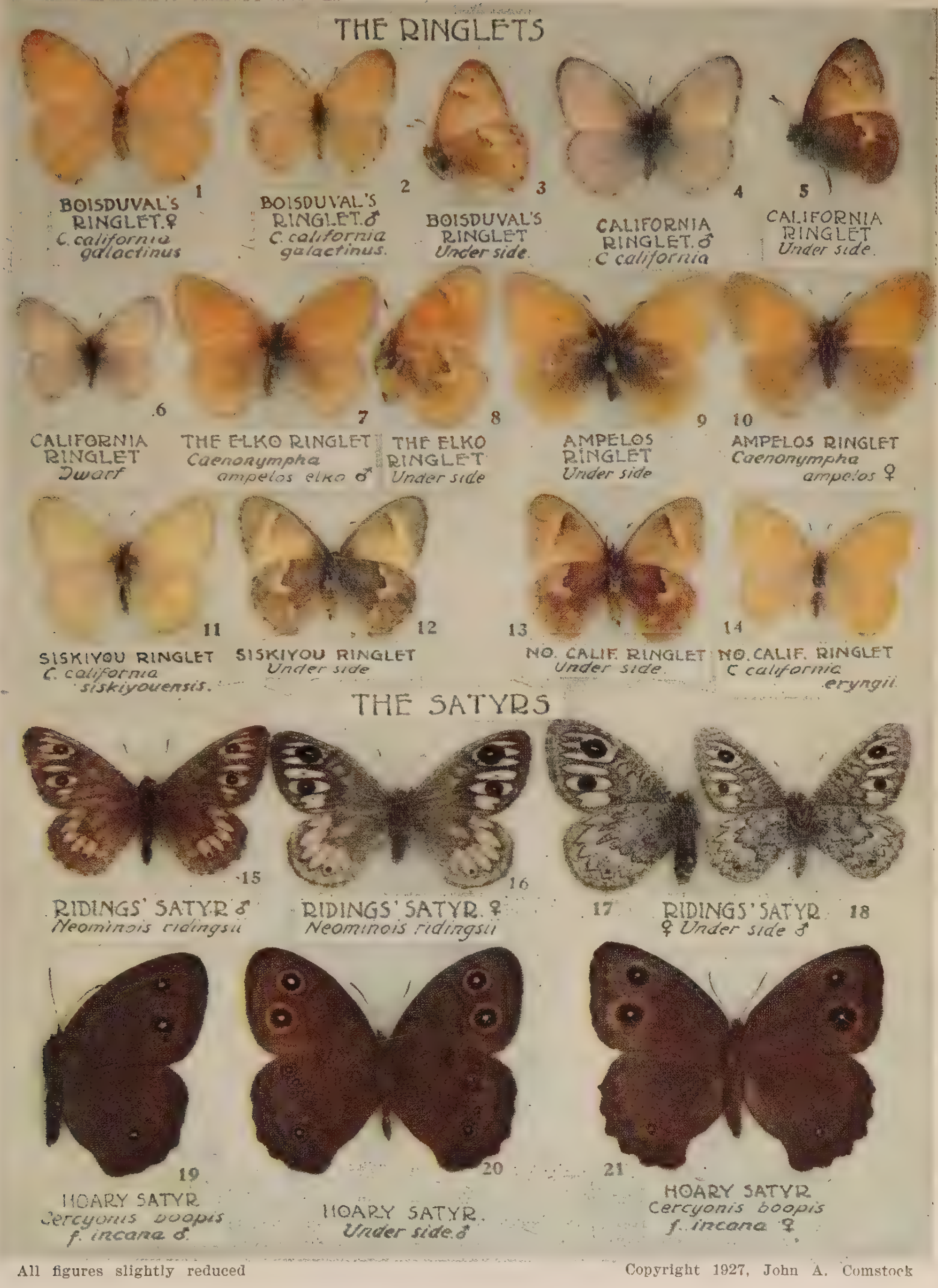
THE MILKWEED
BUTTERFLIES

All figures slightly reduced

Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 18

| | | Text Page |
|---|---|---|
| Fig. 1. | *Coenonympha california galactinus* Bdv. ♀. San Gabriel Mts., Cal. July 22, 1917 | 66 |
| Fig. 2. | *C. california galactinus* Bdv. ♂. San Gabriel Mts., Cal. July 22, 1917 | 66 |
| Fig. 3. | *C. california galactinus* Bdv. ♂, under side. San Gabriel Mts., Cal. July 22, 1917 | 66 |
| Fig. 4. | *C. california* West. & Hew. ♂. Los Angeles, Cal. May 20, 1918 | 65 |
| Fig. 5. | *C. california* West. & Hew. ♂, under side. Los Angeles, Cal. May 20, 1918 | 65 |
| Fig. 6. | *C. california* West. & Hew. ♂, dwarf. Los Angeles, Cal. June 6, 1921 | 65 |
| Fig. 7. | *C. ampelos elko* Edw. ♂. Northeastern Cal. Aug., 1920 | 68 |
| Fig. 8. | *C. ampelos elko* Edw. ♀ under side. Northeastern Cal. Aug., 1920 | 68 |
| Fig. 9. | *C. ampelos* Edw. ♂, under side. Wallace, Idaho. July 4, 1916 | 67 |
| Fig. 10. | *C. ampelos* Edw. ♀, Wallace, Idaho. July 9, 1920 | 67 |
| Fig. 11. | *C. california siskiyouensis* Comst. ♂. Siskiyou Co., Cal. July, 1923. Holotype | 67 |
| Fig. 12. | *C. california siskiyouensis* Comst. ♂, under side. Siskiyou Co. Cal. July, 1923. Paratype | 67 |
| Fig. 13. | *C. california eryngii* Hy. Edw. ♂, under side. North of Mt. Shasta, Cal. Aug., 1923 | 67 |
| Fig. 14. | *C. california eryngii* Hy. Edw. ♂. North of Mt. Shasta, Cal. Aug., 1923 | 67 |
| Fig. 15. | *Neominois ridingsii* Edw. ♂. Near Mammoth Camp, Mono Co. Cal. July 25, 1922 | 69 |
| Fig. 16. | *N. ridingsii* Edw. ♀. Near Mammoth Camp, Mono Co. Cal. July 25, 1922 | 69 |
| Fig. 17. | *N. ridingsii* Edw. ♀, under side. Near Mammoth Camp, Mono Co. Cal. July 25, 1922 | 69 |
| Fig. 18. | *N. ridingsii* Edw. ♂, under side. Near Mammoth Camp, Mono Co. Cal. July 25, 1922 | 69 |
| Fig. 19. | *Cercyonis alope boopis* f. *incana* Edw. ♂. Near Davis Creek, Modoc Co. Cal. July 29, 1923 | 70 |
| Fig. 20. | *C. alope boopis* f. *incana* Edw. ♂, under side. Shasta Co. Cal. July 5, 1921 | 70 |
| Fig. 21. | *C. alope boopis* f. *incana* Edw. ♀. Plumas Co. Cal. Aug. 15, 1923 | 70 |



THE RINGLETS

1 BOISDUVAL'S RINGLET ♀ C. california galactinus

2 BOISDUVAL'S RINGLET ♂ C. california galactinus.

3 BOISDUVAL'S RINGLET Under side.

4 CALIFORNIA RINGLET ♂ C california

5 CALIFORNIA RINGLET Under side.

6 CALIFORNIA RINGLET Dwarf

7 THE ELKO RINGLET Caenonympha ampelos elko ♂

8 THE ELKO RINGLET Under side

9 AMPELOS RINGLET Under side

10 AMPELOS RINGLET Caenonympha ampelos ♀

11 SISKIYOU RINGLET C. california siskiyouensis.

12 SISKIYOU RINGLET Under side

13 NO. CALIF. RINGLET Under side.

14 NO. CALIF. RINGLET C californic eryngii

THE SATYRS

15 RIDINGS' SATYR ♂ Neominois ridingsii

16 RIDINGS' SATYR ♀ Neominois ridingsii

17 RIDINGS' SATYR ♀ Under side ♂ 18

19 HOARY SATYR Cercyonis boopis f. incana ♂

20 HOARY SATYR Under side ♂

21 HOARY SATYR Cercyonis boopis f. incana ♀

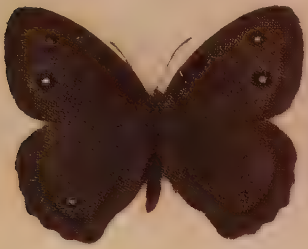
All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 19

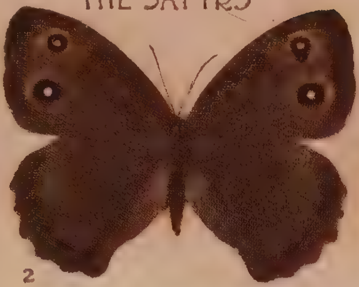
| | | Text Page |
|---|---|---|
| Fig. 1. | *Cercyonis alope boopis* Behr ♂. Carmel, Monterey Co. Cal. July 7, 1921 | 70 |
| Fig. 2. | *C. alope boopis* Behr ♀. Prosser, Wash. April 25, 1921 | 70 |
| Fig. 3. | *C. alope boopis* Behr ♀, under side. Prosser, Wash. April 25, 1921 | 70 |
| Fig. 4. | *C. alope boopis* f. *baroni* Edw. ♂. Near Klamath Falls, Ore. Aug. 1, 1923 | 70 |
| Fig. 5. | *C. alope boopis* f. *baroni* Edw. ♂, under side. Near Klamath Falls, Ore. Aug. 1, 1923 | 70 |
| Fig. 6. | *C. alope boopis* f. *baroni* Edw. ♀. Near Klamath Falls, Ore. Aug. 1, 1923 | 70 |
| Fig. 7. | *C. ariane* f. *stephensi* Wright ♀. Near Davis Creek, Modoc Co. Cal. July 29, 1923 | 71 |
| Fig. 8. | *C. ariane* Bdv. ♀. Surprise Valley near Ft. Bidwell, Modoc Co. Cal. July 30, 1923 | 71 |
| Fig. 9. | *C. ariane* Bdv. ♀, under side. Near Davis Creek, Modoc Co. Cal. July 29, 1923 | 71 |
| Fig. 10. | *C. ariane* Bdv. ♂. Surprise Valley near Ft. Bidwell, Modoc Co. Cal. July 30, 1923 | 71 |
| Fig. 11. | *C. ariane wheeleri* Edw. ♀, under side. From illustration, Wheeler Survey | 72 |
| Fig. 12. | *C. ariane* Bdv. ♂, under side. Near Davis Creek, Modoc Co. Cal. July 29, 1923 | 71 |

# THE SATYRS



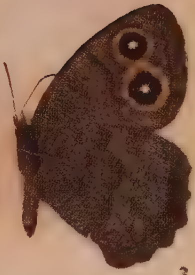
1

THE BOOPIS SATYR ♂
*Cercyonis alope boopis*



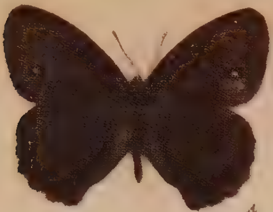
2

THE BOOPIS SATYR ♀
*Cercyonis alope boopis*



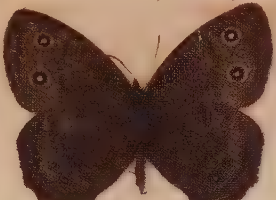
3

THE BOOPIS SATYR
*Under side.* ♀



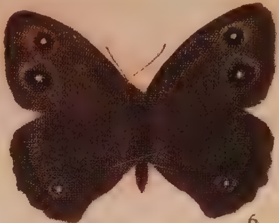
4

BARON'S SATYR
*C. alope baroni* ♂



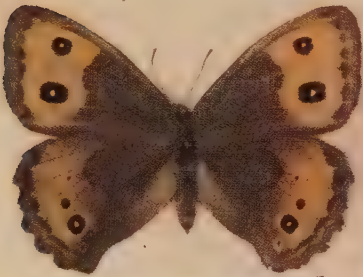
5

BARON'S SATYR
*Under side.* ♂



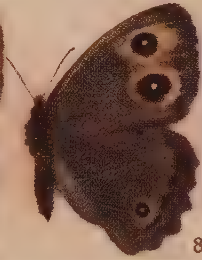
6

BARON'S SATYR
*C. alope baroni* ♀



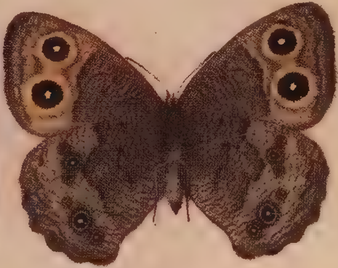
7

STEPHEN'S SATYR
*C. ariane stephensi* ♀



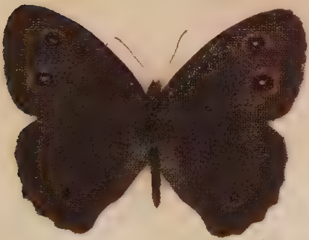
8

ARIANE SATYR
*Cercyonis alope*
*ariane* ♀



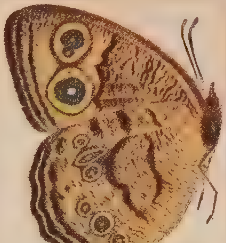
9

ARIANE SATYR
*Under side.* ♀



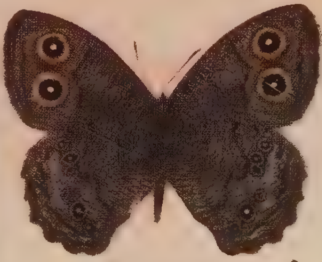
10

ARIANE SATYR
*Cercyonis alope*
*ariane* ♂



11

WHEELER'S SATYR
*C. wheeleri. Under side* ♀



12

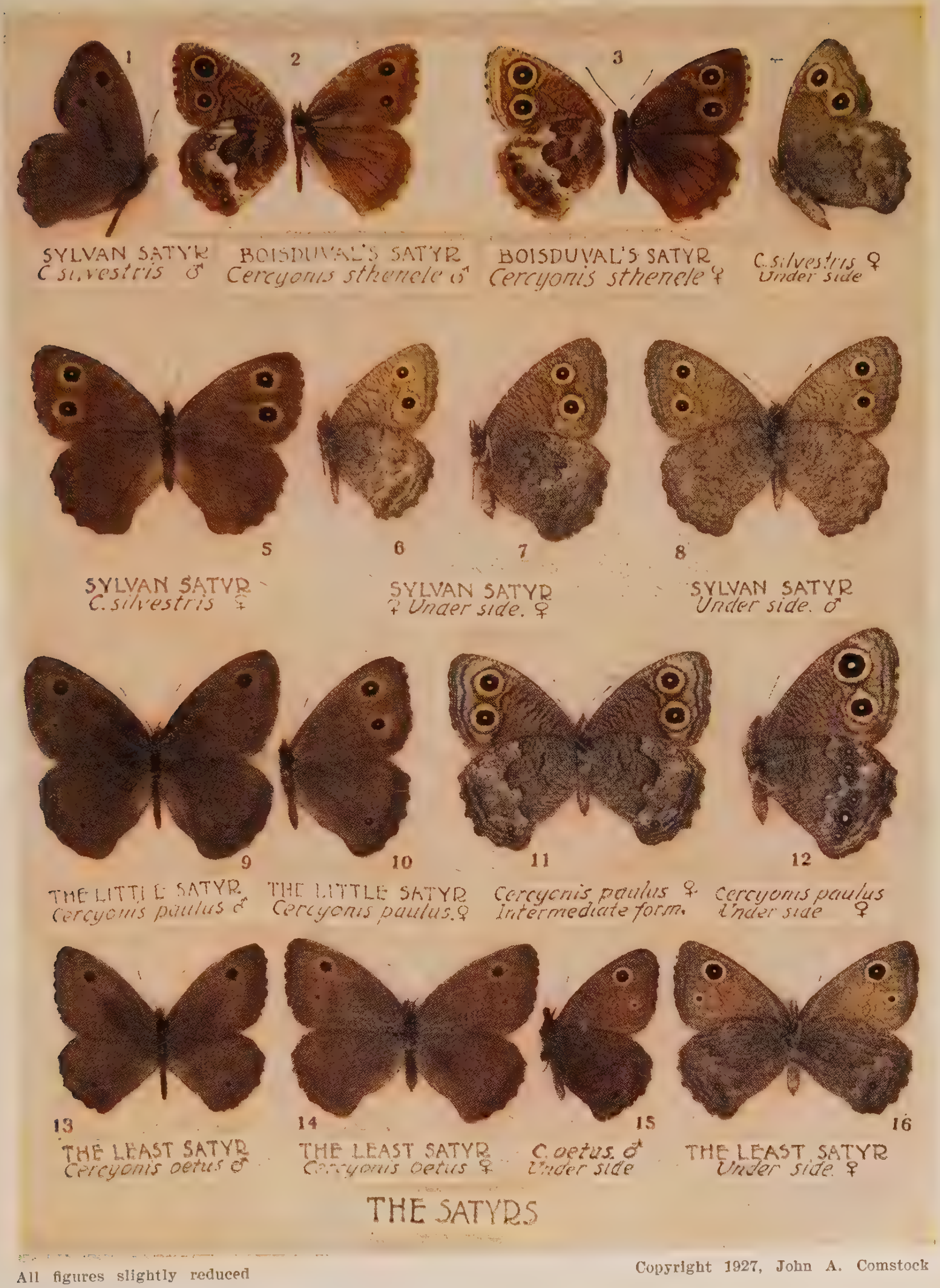
ARIANE SATYR
*Under side.* ♂

All figures slightly reduced

Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 20

| | | Text Page |
|---|---|---|
| Fig. 1. | *Cercyonis silvestris* Edw. ♂, Ridge Route, Sierra Madre Mts., Cal. June 21, 1923 | 73 |
| Fig. 2. | *C. sthenele* Bdv. ♂. From Dr. Oberthur's figure of Boisduval's type. The left half of figure represents the under side | 73 |
| Fig. 3. | *C. sthenele* Bdv. ♀. From Dr. Oberthur's figure of Boisduval's type. The left half of figure represents the under side | 73 |
| Fig. 4. | *C. silvestris* Edw. ♀, under side, Ridge Route, Sierra Madre Mts,. Cal. June 15, 1920 | 73 |
| Fig. 5. | *C. silvestris* Edw. ♀, San Bernardino Mts., Cal. El. 5,500 ft. August 1, 1907 | 73 |
| Fig. 6. | *C. silvestris* Edw. ♀, under side, Tehachapi Mts., Cal. July 11, 1918 | 73 |
| Fig. 7. | *C. silvestris* Edw. ♀, under side, Tehachapi Mts., Cal. July 7, 1918 | 73 |
| Fig. 8. | *C. silvestris* Edw. ♂, under side, Griffith Park, Los Angeles, Cal. June 20, 1920 | 73 |
| Fig. 9. | *C. silvestris paulus* Edw. ♂, Klamath Lake, Ore. July 28, 1922 | 74 |
| Fig. 10. | *C. silvestris paulus* Edw. ♀, Topaz Lake, Cal. July 24, '23. | 74 |
| Fig. 11. | *C. silvestris paulus* Edw. ♀, under side, Mono Lake, Cal. August 5, 1922 | 74 |
| Fig. 12. | *C. silvestris paulus* Edw. ♀, under side, Mt. Shasta, Cal. August 5, 1922 | 74 |
| Fig. 13. | *C. oetus* Bdv. ♂, Mammoth Camp, Mono Co., Cal. July 22, 1922 | 75 |
| Fig. 14. | *C. oetus* Bdv. ♀, Mammoth Camp, Mono Co., Cal. July 26, 1922 | 75 |
| Fig. 15. | *C. oetus* Bdv. ♂, under side, Blue River, Colo. July 30, 1902 | 75 |
| Fig. 16. | *C. oetus* Bdv. ♀, under side, Rush Creek, Mono Co., Cal. July 25, 1919 | 75 |



SYLVAN SATYR
*C. silvestris* ♂

BOISDUVAL'S SATYR
*Cercyonis sthenele* ♂

BOISDUVAL'S SATYR
*Cercyonis sthenele* ♀

*C. silvestris* ♀
Under side

SYLVAN SATYR
*C. silvestris* ♀

SYLVAN SATYR
♀ Under side. ♀

SYLVAN SATYR
Under side. ♂

THE LITTLE SATYR
*Cercyonis paulus* ♂

THE LITTLE SATYR
*Cercyonis paulus.* ♀

*Cercyonis paulus* ♀
Intermediate form.

*Cercyonis paulus*
Under side ♀

THE LEAST SATYR
*Cercyonis oetus* ♂

THE LEAST SATYR
*Cercyonis oetus* ♀

*C. oetus.* ♂
Under side

THE LEAST SATYR
Under side. ♀

THE SATYRS

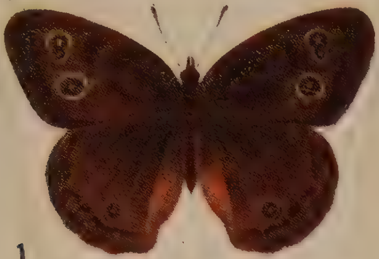
All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 21

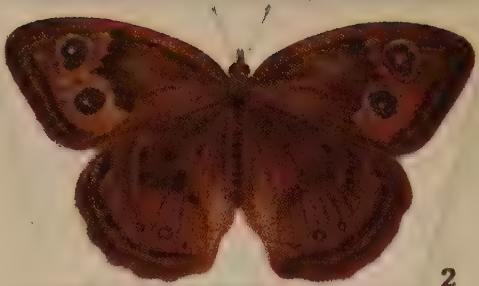
| | | Text Page |
|---|---|---|
| Fig. 1. | *Cercyonis ariane wheeleri* Edw. ♂. From illustration in Wheeler's Report | 72 |
| Fig. 2. | *C. ariane wheeleri* Edw. ♀. From illustration in Wheeler's Report | 72 |
| Fig. 3. | *Oeneis nevadensis* F. & F. ♂. Mt. Shasta, Cal. Aug. 5, 1923 | 76 |
| Fig. 4. | *O. nevadensis* F. & F. ♀. Mt. Shasta, Cal. Aug. 5, 1923 | 76 |
| Fig. 5. | *O. nevadensis* F. & F. ♂, under side. Mt. Shasta, Cal. Aug. 5, 1923 | 76 |
| Fig. 6. | *O. ivallda* Mead ♂. Kearsarge Pass, Cal. Aug. 15, 1914 | 77 |
| Fig. 7. | *O. ivallda* Mead ♂. Peaks above Mammoth Camp, Mono Co., Cal. July 20, 1922 | 77 |
| Fig. 8. | *O. ivallda* Mead ♀. Peaks above Mammoth Camp, Mono Co., Cal. July 20, 1922 | 77 |
| Fig. 9. | *O. ivallda* Mead ♀. Peaks above Mammoth Camp, Mono Co., Cal. July 20, 1922 | 77 |
| Fig. 10. | *O. ivallda* Mead ♀, under side. Peaks above Mammoth Camp, Mono Co., Cal. July 20, 1922 | 77 |

## THE SATYRS



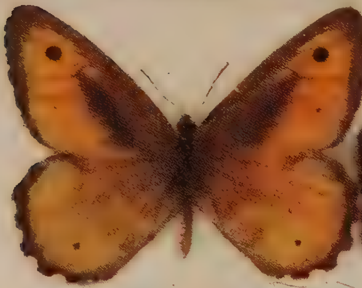
1

WHEELER'S SATYR.
*Cercyonis wheeleri* ♂



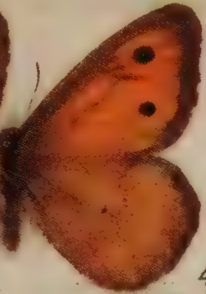
2

WHEELER'S SATYR.
*Cercyonis wheeleri* ♀



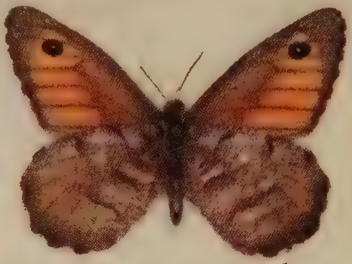
3

GREAT ARCTIC
*Oeneis nevadensis* ♂



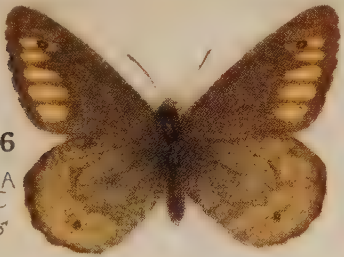
4

GREAT ARCTIC
*Oeneis nevadensis* ♀



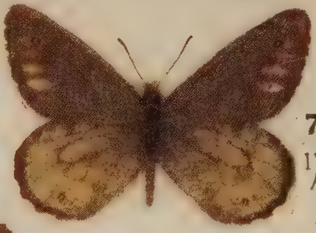
5

GREAT ARCTIC
*Under side* ♂



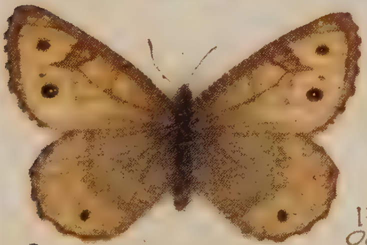
6

IVALLDA ARCTIC
*Light form* ♂



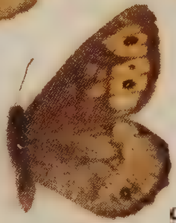
7

IVALLDA ARCTIC
*Dark form* ♂



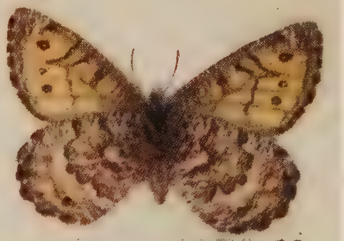
8

IVALLDA ARCTIC
*Oeneis ivallda* ♀



9

IVALLDA ARCTIC
*Oeneis ivallda* ♀



10

IVALLDA ARCTIC
*Under side* ♀

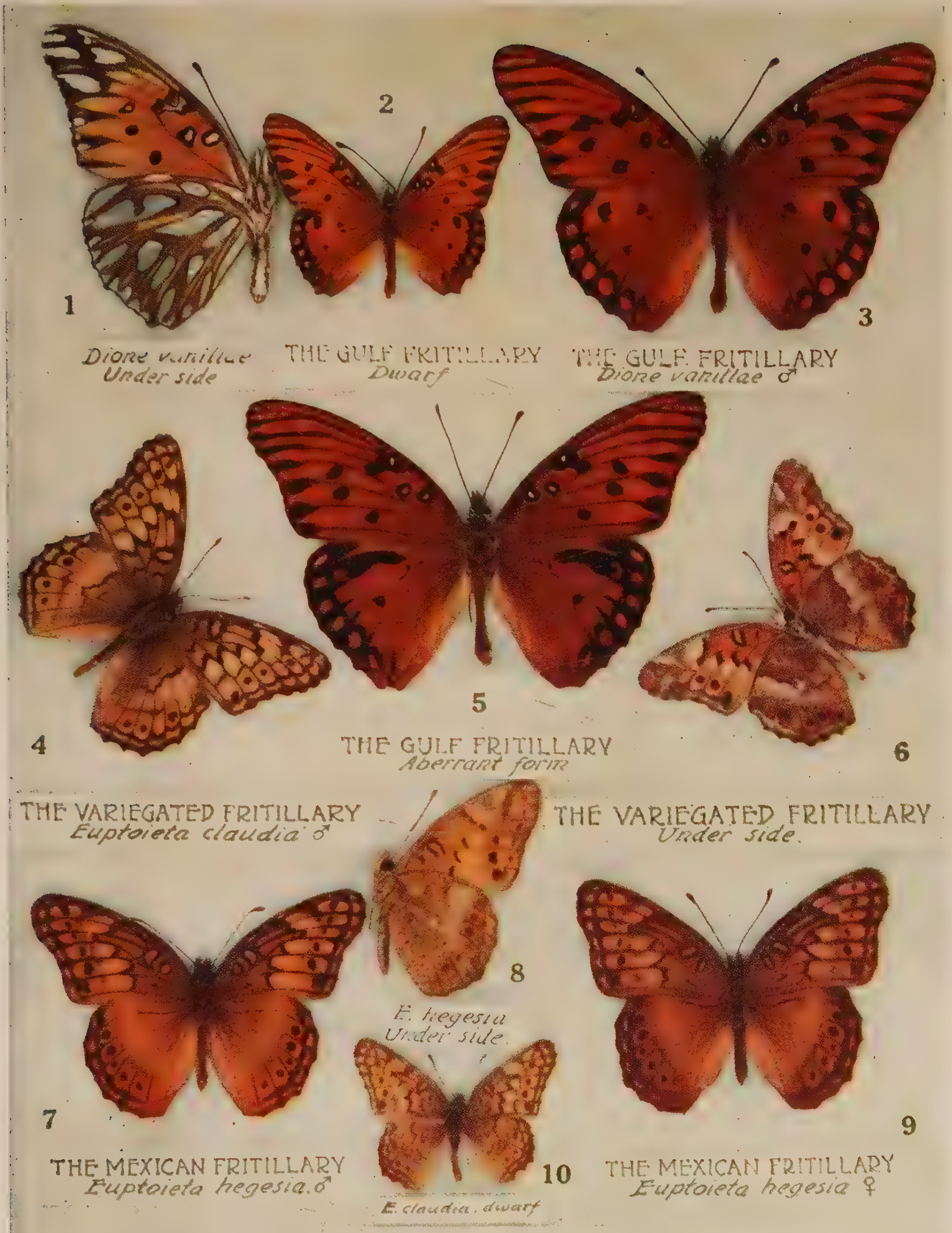
## THE ARCTICS

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 22

| | | Text Page |
|---|---|---|
| Fig. 1. | *Dione vanillæ* L. ♂, under side. Stemper, Fla. Oct. 14, 1915 | 78 |
| Fig. 2. | *D. vanillæ* L. ♂, dwarf. Los Angeles, Cal. Oct. 20, 1918 | 78 |
| Fig. 3. | *D. vanillæ* L. ♂. Los Angeles, Cal. Sept. 30, 1918 | 78 |
| Fig. 4. | *Euptoieta claudia* Cram. ♂. Flagstaff, Ariz. Aug. 29, 1919. | 80 |
| Fig. 5. | *Dione vanillæ* L. ♀, aberrant. Santa Monica, Cal. Oct. 10, 1914 | 78 |
| Fig. 6. | *Euptoieta claudia* Cram. ♂, under side. Troy, Ill. June 3, 1913 | 80 |
| Fig. 7. | *E. hegesia* Cram. ♂. Jalapa, Mexico | 80 |
| Fig. 8. | *E. hegesia* Cram. ♂, under side. Jalapa, Mexico | 80 |
| Fig. 9. | *E. hegesia* Cram. ♀. Jalapa, Mexico | 80 |
| Fig. 10. | *E. claudia* Cram. ♂, dwarf. Evanston, Ill. July 30, 1901 | 80 |


1
Dione vanillae
Under side
2
THE GULF FRITILLARY
Dwarf
3
THE GULF FRITILLARY
Dione vanillae ♂
4
5
THE GULF FRITILLARY
Aberrant form
6
THE VARIEGATED FRITILLARY
Euptoieta claudia ♂
THE VARIEGATED FRITILLARY
Under side
8
E. hegesia
Under side
7
9
THE MEXICAN FRITILLARY
Euptoieta hegesia ♂
10
E. claudia, dwarf
THE MEXICAN FRITILLARY
Euptoieta hegesia ♀

THE FRITILLARIES

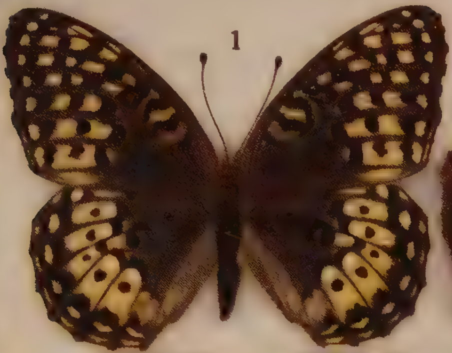
All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 23

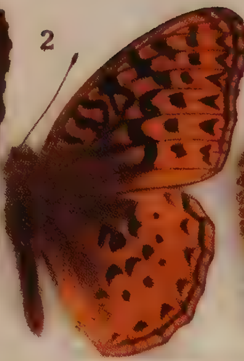
| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis apacheana* Skin. ♀, Round Valley, Inyo Co., Cal. August 1, 1922 | 81 |
| Fig. 2. | *A. apacheana* Skin. ♂, Round Valley, Inyo Co., Cal. August 24, 1922 | 81 |
| Fig. 3. | *A. apacheana* Skin. ♂, under side, Round Valley, Inyo Co., Cal. July 24, 1922 | 81 |
| Fig. 4. | *A. apacheana* ab. *hermosa* Comst. ♂, Round Valley, Inyo Co., Cal. July 30, 1922. Type | 81 |
| Fig. 5. | *A. leto* Behr ♂, Shasta Meadows, Shasta Co., Cal. July 10, 1921 | 81 |
| Fig. 6. | *A. leto* Behr ♀, Utah. No date | 81 |
| Fig. 7. | *A. leto* Behr ♂, under side, Shasta Meadows, Shasta Co., Cal. July 10, 1921 | 81 |
| Fig. 8. | *A. leto* ab. *letis* Wright ♂, Provo, Utah. August 14, 1916 | 82 |

1



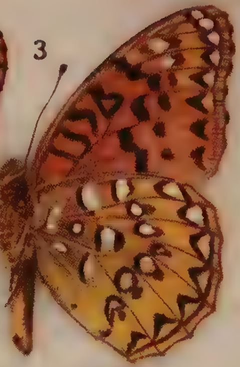
THE APACHE FRITILLARY
*Argynnis apacheana.* ♀

2



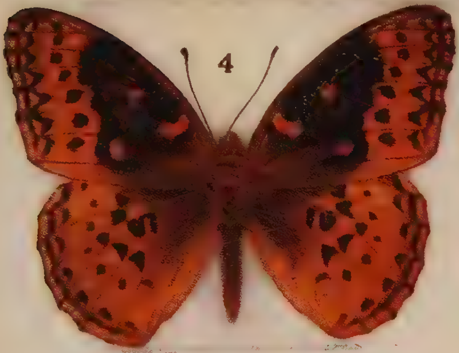
THE APACHE FRITILLARY
*Argynnis apacheana.* ♂

3



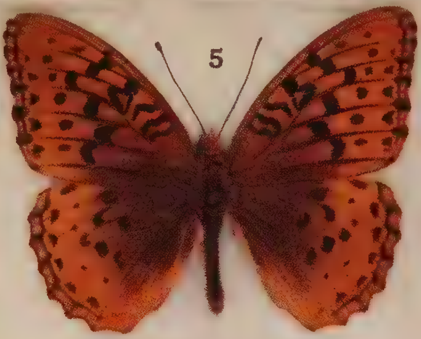
*A. apacheana*
*Under side.* ♂

4



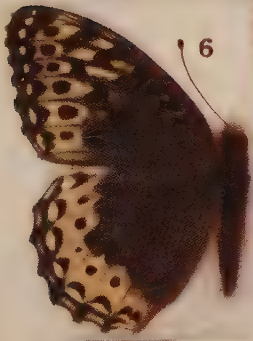
THE ABERRANT APACHE
*A. apacheana ab. hermosa.*

5



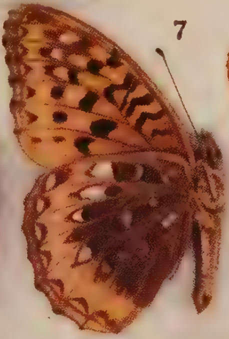
THE LETO FRITILLARY
*Argynnis leto* ♂

6



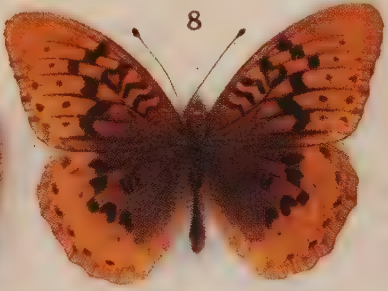
THE LETO
FRITILLARY ♀

7



THE LETO FRITILLARY
*Under side* ♂

8



THE LESSER LETO
*A. leto letis.* ♂

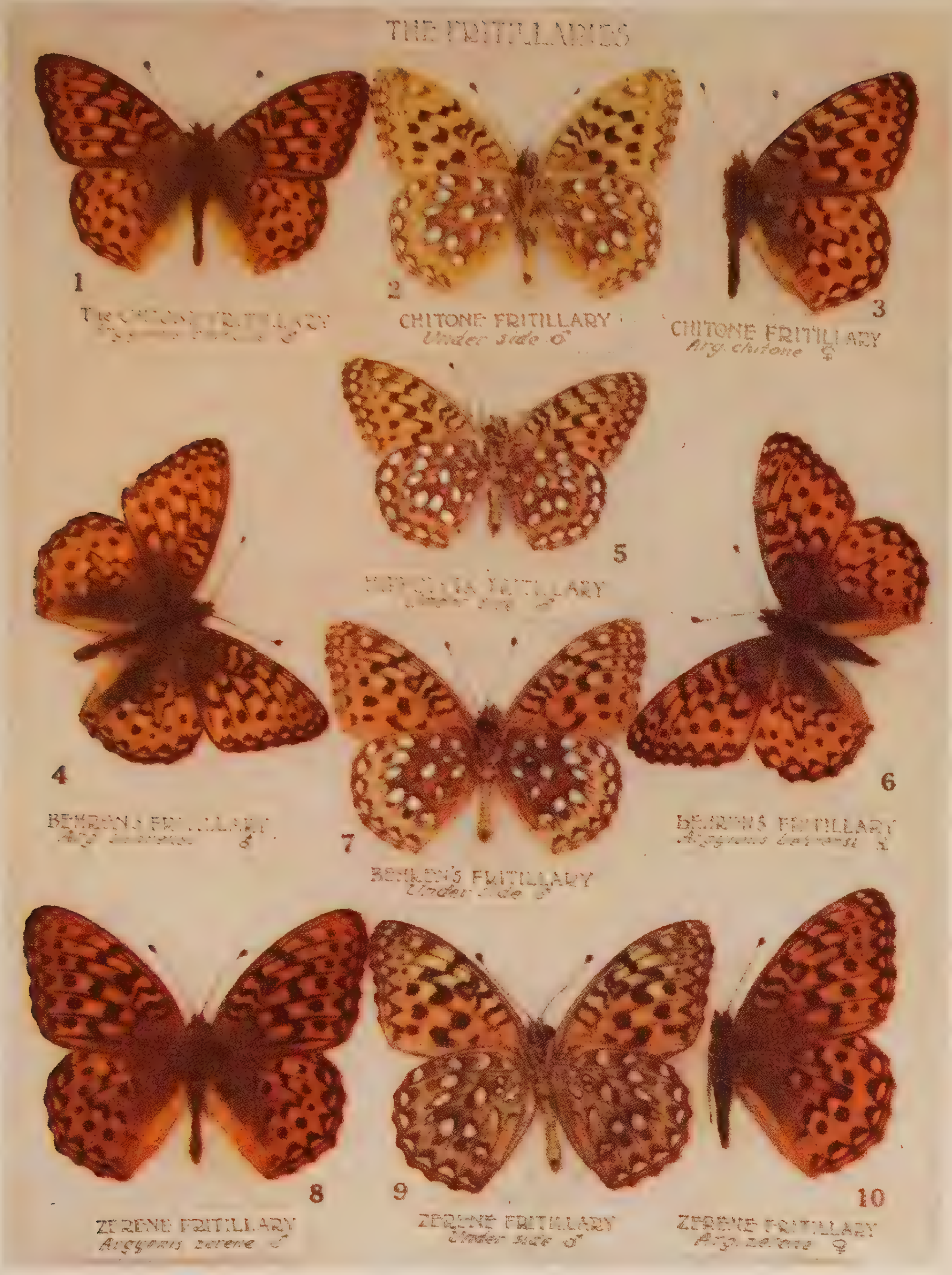
## THE FRITILLARIES

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 24

| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis chitone* Edw. ♂, Provo, Utah. July 9, 1919.... | 82 |
| Fig. 2. | *A. chitone* Edw. ♂, under side. Provo Utah, North Fork. July 25, 1923.................................. | 82 |
| Fig. 3. | *A. chitone* Edw. ♀. Slate Canyon, Provo, Utah. June 9, 1918 .......................................... | 82 |
| Fig. 4. | *A. behrensii* Edw. ♂. Mendocino Co., Cal. July 19, 1920.. | 83 |
| Fig. 5. | *A. bremnerii hippolyta* Edw. ♂. No data. Courtesy Dr. Wm. Barnes ................................ | 82 |
| Fig. 6. | *A. behrensii* Edw. ♀. No. Calif. No data. Courtesy Dr. Henry Skinner ............................... | 83 |
| Fig. 7. | *A. behrensii* Edw. ♂, under side. Cedar Breaks, Southern Utah. June 9, 1918............................. | 83 |
| Fig. 8. | *A. zerene* Bdv. ♂. Wawona, near Yosemite, Cal. June 27, 1921 ....................................... | 83 |
| Fig. 9. | *A. zerene* Bdv. ♂, under side. Wawona, near Yosemite, Cal. June 27, 1921............................... | 83 |
| Fig. 10. | *A. zerene* Bdv. ♀. Shasta Co., Cal., July 1, 1921........ | 83 |

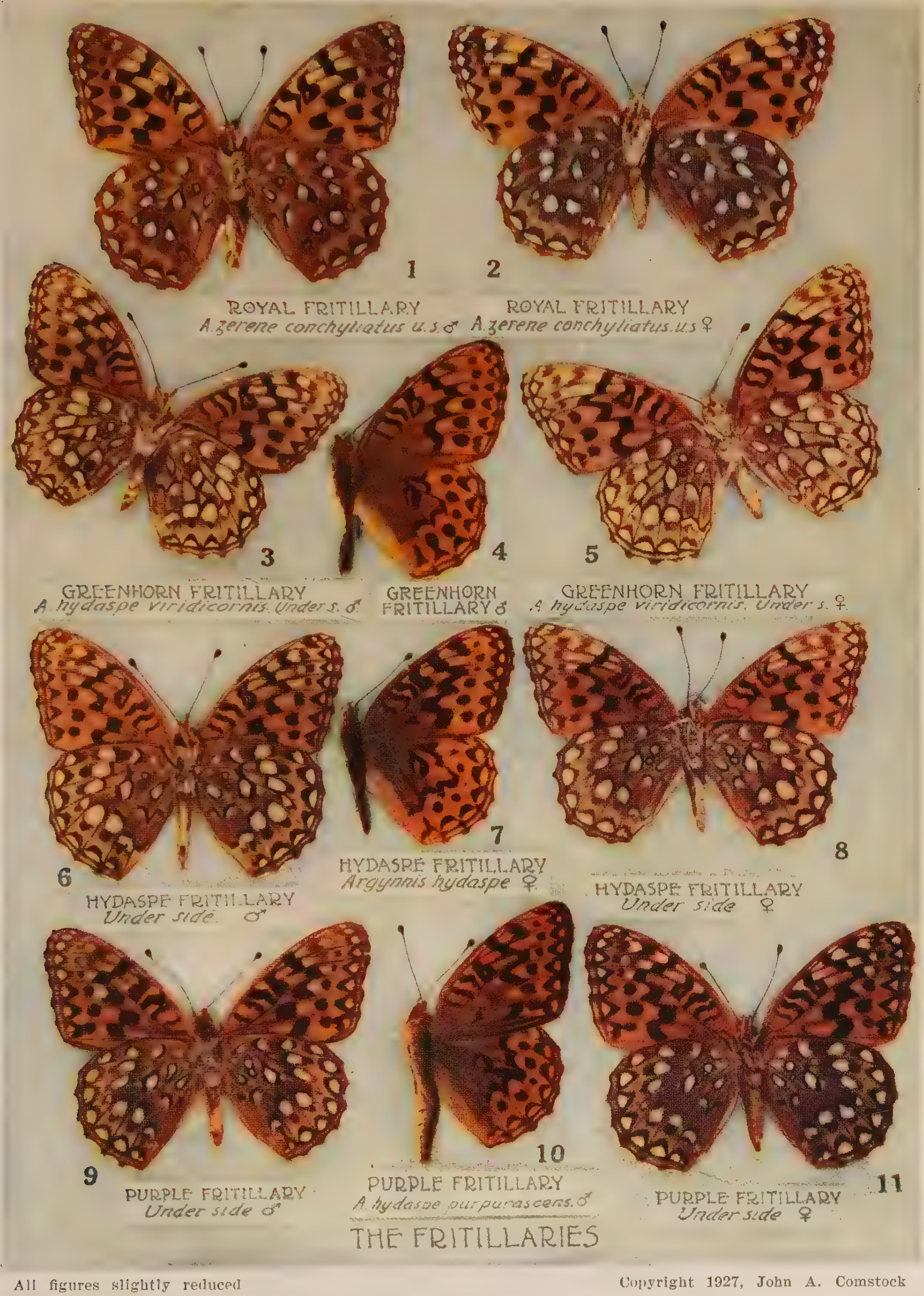

THE FRITILLARIES
1
FRITILLARY
2
CHITONE FRITILLARY
Under side ♂
3
CHITONE FRITILLARY
Arg. chitone ♀
5
FRITILLARY
Under side ♂
4
BEHRENS' FRITILLARY
Arg. behrensi ♂
7
BEHREN'S FRITILLARY
Under side ♂
6
BEHREN'S FRITILLARY
Argynnis behrensi ♀
8
ZERENE FRITILLARY
Argynnis zerene ♂
9
ZERENE FRITILLARY
Under side ♂
10
ZERENE FRITILLARY
Arg. zerene ♀

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 25

| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis zerene conchyliatus* Comst. ♂, under side. Mt. Shasta, Cal. July 19, 1921. Holotype | 84 |
| Fig. 2. | *A. zerene conchyliatus* Comst. ♀, under side. No. Calif. No date. Allotype. Courtesy J. E. Cottle | 84 |
| Fig. 3. | *A. hydaspe viridicornis* Comst. ♂, under side. Greenhorn Mts. Cal. July, 1923. Holotype. Courtesy W. H. Ireland | 85 |
| Fig. 4. | *A. hydaspe viridicornis* Comst. ♂. Greenhorn Mts. Cal. July, 1923. Paratype | 85 |
| Fig. 5. | *A. hydaspe viridicornis* Comst. ♀, under side. Greenhorn Mts., Cal. July, 1923. Allotype. Courtesy W. H. Ireland | 85 |
| Fig. 6. | *A. hydaspe* Bdv. ♂, under side. Wawona nr. Yosemite, Cal. June 16, 1921 | 84 |
| Fig. 7. | *A. hydaspe* Bdv. ♀. Wawona nr. Yosemite, Cal. July 5, 1921 | 84 |
| Fig. 8. | *A. hydaspe* Bdv. ♀, under side, Wawona nr. Yosemite, Cal. July 5, 1921 | 84 |
| Fig. 9. | *A. hydaspe purpurascens* Hy. Edw. ♂, under side. Shasta Co. Cal. June 27, 1921 | 85 |
| Fig. 10. | *A. hydaspe purpurascens* Hy. Edw. ♂. Shasta Co. Cal. June 30, 1921 | 85 |
| Fig. 11. | *A. hydaspe purpurascens* Hy. Edw. ♀, under side. Shasta Co. Cal. June 30, 1921 | 85 |



1 2

ROYAL FRITILLARY
*A. zerene conchyliatus u. s. ♂*

ROYAL FRITILLARY
*A. zerene conchyliatus u. s. ♀*

3

GREENHORN FRITILLARY
*A. hydaspe viridicornis. Under s. ♂*

4

GREENHORN FRITILLARY ♂

5

GREENHORN FRITILLARY
*A. hydaspe viridicornis. Under s. ♀*

6

HYDASPE FRITILLARY
*Under side ♂*

7

HYDASRE FRITILLARY
*Argynnis hydaspe ♀*

8

HYDASPE FRITILLARY
*Under side ♀*

9

PURPLE FRITILLARY
*Under side ♂*

10

PURPLE FRITILLARY
*A. hydaspe purpurascens. ♂*

11

PURPLE FRITILLARY
*Under side ♀*

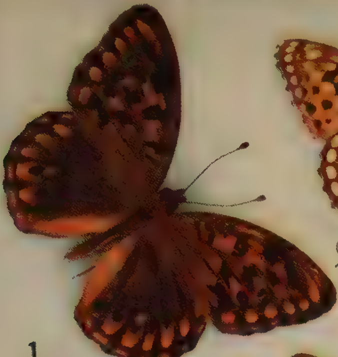
THE FRITILLARIES

All figures slightly reduced

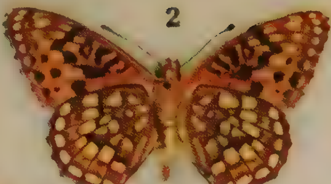
Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 26

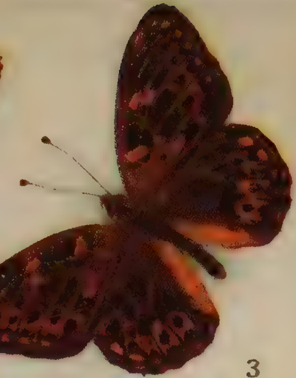
| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis zerene* ab. *shastaensis* Comst. ♂, Mt. Shasta, Siskiyou Co., Cal., July. Courtesy Mr. J. E. Cottle | 84 |
| Fig. 2. | *A. cottlei* Comst. ♀, under side, near Alturas, Modoc Co., Cal., no date | 83 |
| Fig. 3. | *A. hydaspe* ab. *caliginosa* Comst. ♂, Modoc Co., Cal., no date. Courtesy Mr. J. E. Cottle | 86 |
| Fig. 4. | *A. irene* Bdv. ♂, Mt. Shasta, Cal., July 19, 1921 | 86 |
| Fig. 5. | *A. irene* Bdv. ♂, under side, Truckee, Cal., July 8, 1924. Courtesy Dr. Wm. Barnes | 86 |
| Fig. 6. | *A. irene* Bdv. ♀, Plumas Co., Cal., July 24, 1920. Courtesy Dr. Wm. Barnes | 86 |
| Fig. 7. | *A. bremnerii hippolyta* Edw. ♂, Ft. Klamath, Ore., July 7, 1895. Courtesy Dr. Henry Skinner | 82 |
| Fig. 8. | *A. bremnerii hippolyta* Edw. ♀, under side, Middle Calif., no date. Courtesy Dr. Wm. Barnes. (Label marked "agrees closely with ♂ from Calif. in Edward's Coll." by Dr. McD.) | 82 |
| Fig. 9. | *Brenthis epithore* Edw. ♂, Lassen Co., Cal., July 27, 1923. | 96 |
| Fig. 10. | *B. epithore* ab. *wawonæ* Gunder ♂, (type), Wawona, Mariposa Co., Cal., July 6, 1922. Courtesy Jean Gunder | 96 |
| Fig. 11. | *B. epithore* Edw. ♂, under side, Lassen Co., Cal., July 27, 1923 | 96 |


1

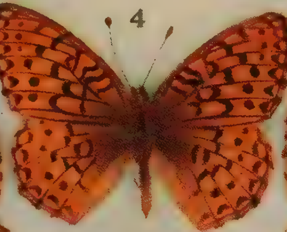
SHASTA FRITILLARY
*Arg. ab. shastaensis*


2

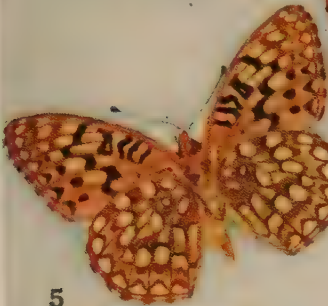
COTTLE'S FRITILLARY
*Argynnis cottlei*


3

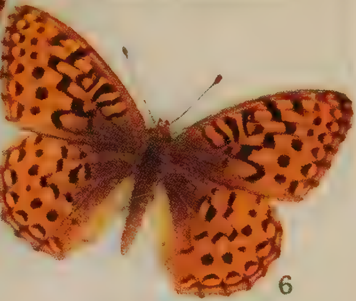
THE DARK FRITILLARY
*Argynnis ab. caliginosa.*


4

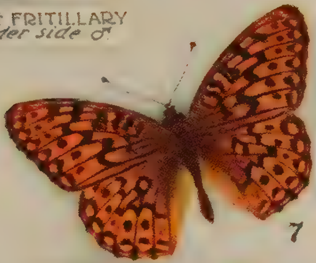
IRENE FRITILLARY
*Argynnis irene* ♂


5

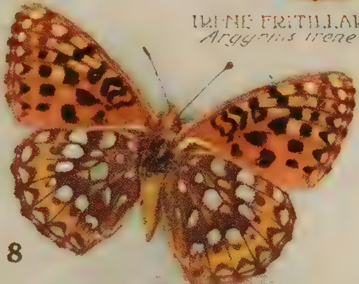
IRENE FRITILLARY
*Under side* ♂


6

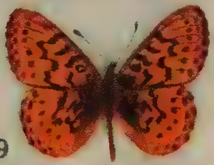
IRENE FRITILLARY
*Argynnis irene* ♀


7

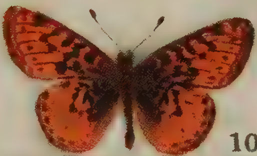
HIPPOLYTA FRITILLARY
*Argynnis hippolyta* ♂


8

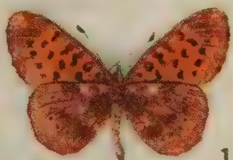
HIPPOLYTA FRITILLARY
*Under side* ♀


9

WESTERN MEADOW
FRITILLARY *B. epithore* ♂


10

WAWONA FRITILLARY
*Brenthis epithore wawonae*


11

WESTERN MEADOW
FRITILLARY *Under side* ♂

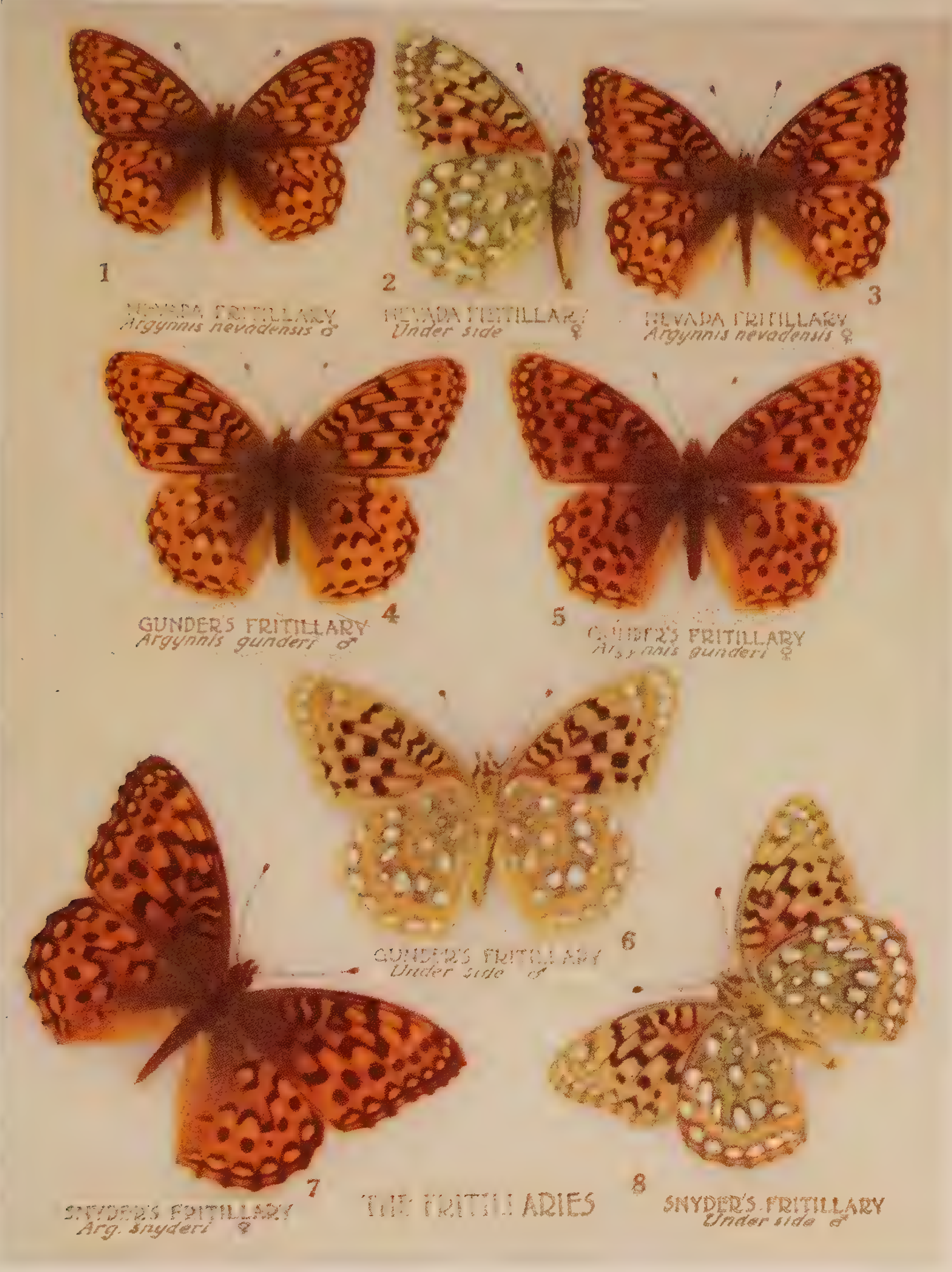
THE FRITILLARIES

All figures slightly reduced

Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 27

| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis nevadensis* Edw. ♂. Mammoth Camp, Mono Co. Cal. July 21, 1923 | 86 |
| Fig. 2. | *A. nevadensis* Edw. ♀, under side. Topaz Lake, Cal. July 24, 1923 | 86 |
| Fig. 3. | *A. nevadensis* Edw. ♀. Mammoth Camp, Mono Co. Cal. July 21, 1923 | 86 |
| Fig. 4. | *A. snyderi gunderi* Comst. ♂. Modoc Co. Cal. June 3, 1924. Holotype | 87 |
| Fig. 5. | *A. snyderi gunderi* Comst. ♀. Modoc Co. Cal. July 7, 1924. Allotype | 87 |
| Fig. 6. | *A. snyderi gunderi* Comst. ♂, under side. Buck Creek, Modoc Co. Cal. July 21, 1922. Paratype | 87 |
| Fig. 7. | *A. snyderi* Skin. ♀. Eureka, Utah. June 13, 1918 | 87 |
| Fig. 8. | *A. snyderi* Skin. ♂, under side. Reno, Nevada. May 11, 1918 | 87 |



1 NEVADA FRITILLARY *Argynnis nevadensis* ♂

2 NEVADA FRITILLARY *Under side* ♀

3 NEVADA FRITILLARY *Argynnis nevadensis* ♀

4 GUNDER'S FRITILLARY *Argynnis gunderi* ♂

5 GUNDER'S FRITILLARY *Argynnis gunderi* ♀

6 GUNDER'S FRITILLARY *Under side* ♂

7 SNYDER'S FRITILLARY *Arg. snyderi* ♀

THE FRITILLARIES

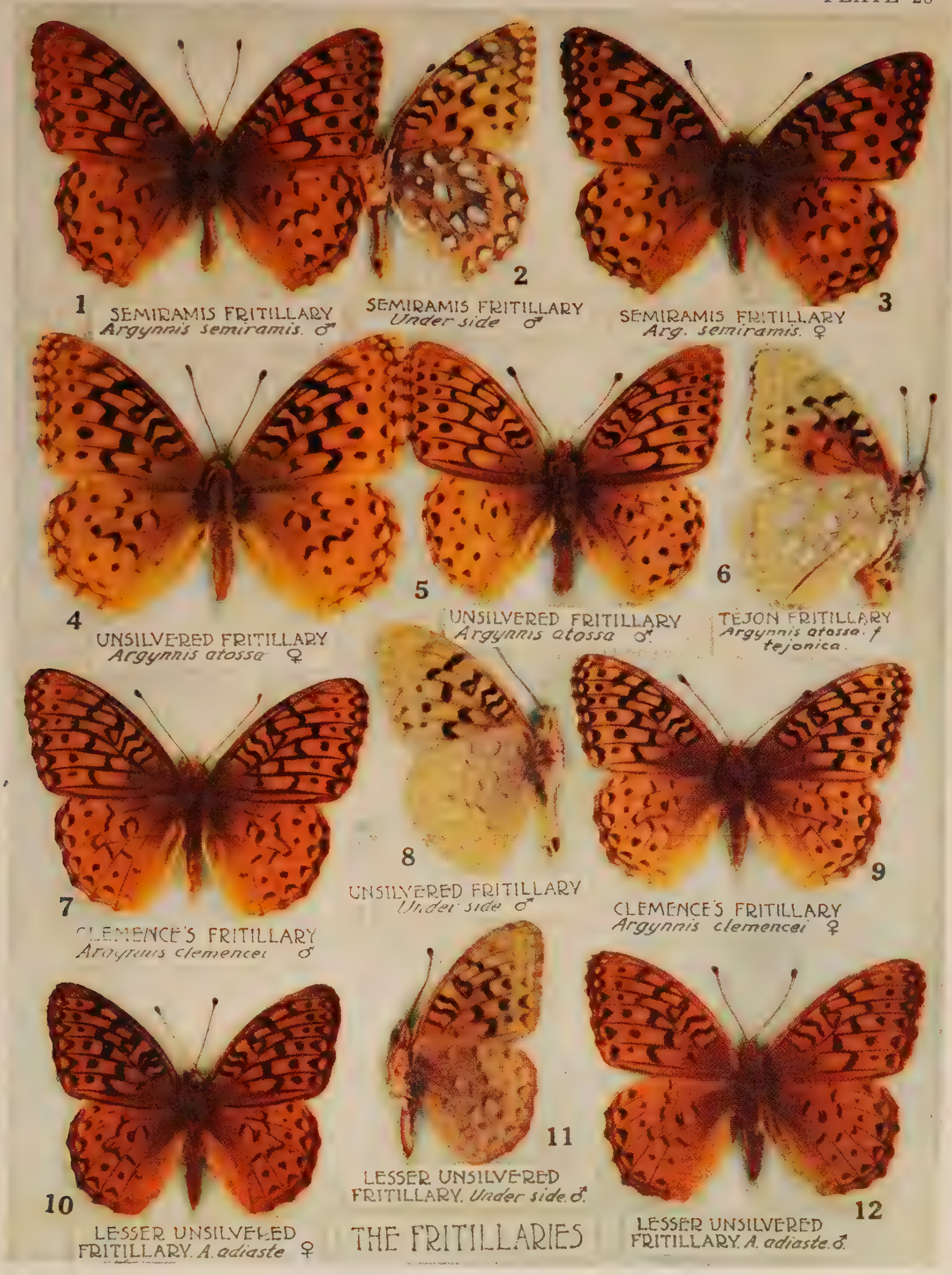
8 SNYDER'S FRITILLARY *Under side* ♂

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 28

| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis semiramis* Edw. ♂. San Bernardino Mts., Cal. June 29, 1920 | 90 |
| Fig. 2. | *A. semiramis* Edw. ♂, under side. San Bernardino Mts. Cal. July 20, 1916 | 90 |
| Fig. 3. | *A. semiramis* Edw. ♀. San Bernardino Mts. Cal. June 24, 1919 | 90 |
| Fig. 4. | *A. adiaste atossa* Edw. ♀. Ridge Route, Sierra Madre Mts. Cal. June 13, 1922 | 89 |
| Fig. 5. | *A. adiaste atossa* Edw. ♂. Ridge Route, Sierra Madre Mts. Cal. June 10, 1922 | 89 |
| Fig. 6. | *A. adiaste atossa* f. *tejonica* Comst. ♀, under side. Collin's Ranch, Tejon region. Aug. 12, 1923. Type. Courtesy of Jean Gunder | 89 |
| Fig. 7. | *A. adiaste clemencei* Comst. ♂. Holotype. Atascadero, Cal. June 30, 1922 | 88 |
| Fig. 8. | *A. adiaste clemencei* Comst. ♂, under side. Paratype. Atascadero, Cal. June 30, 1922 | 88 |
| Fig. 9. | *A. adiaste clemencei* Comst. ♀. Allotype. Atascadero, San Luis Opispo Co. Cal. June 30, 1922 | 88 |
| Fig. 10. | *A. adiaste* Behr ♂. Santa Cruz Mts., Cal. June 12, 1920. (Not ♀ as labeled) | 88 |
| Fig. 11. | *A. adiaste* Behr ♂, under side, Santa Cruz Mts. Cal. June 12, 1920 | 88 |
| Fig. 12. | *A. adiaste* Behr ♀ Santa Cruz Mts., Cal. June 14, 1918. (Not ♂ as labeled) | 88 |



1 SEMIRAMIS FRITILLARY *Argynnis semiramis.* ♂

2 SEMIRAMIS FRITILLARY *Under side* ♂

3 SEMIRAMIS FRITILLARY *Arg. semiramis.* ♀

4 UNSILVERED FRITILLARY *Argynnis atossa* ♀

5 UNSILVERED FRITILLARY *Argynnis atossa* ♂

6 TEJON FRITILLARY *Argynnis atossa, f tejonica.*

7 CLEMENCE'S FRITILLARY *Argynnis clemencei* ♂

8 UNSILVERED FRITILLARY *Under side* ♂

9 CLEMENCE'S FRITILLARY *Argynnis clemencei* ♀

10 LESSER UNSILVERED FRITILLARY. *A. adiaste* ♀

11 LESSER UNSILVERED FRITILLARY. *Under side.* ♂

12 LESSER UNSILVERED FRITILLARY. *A. adiaste.* ♂

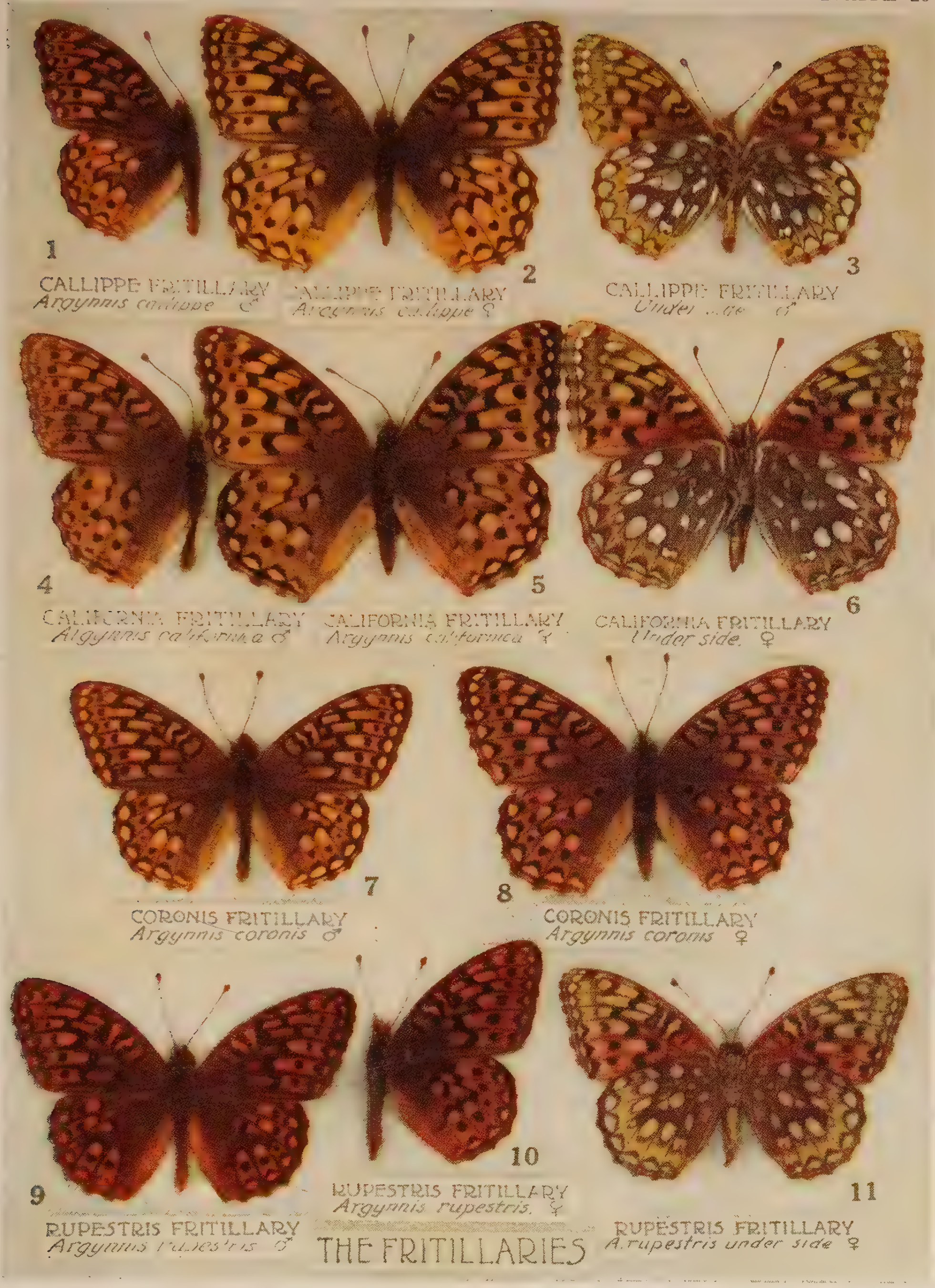
THE FRITILLARIES

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 29

| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis callippe* Bdv. ♂, Griffith Park, Los Angeles, Cal. June 1, 1920 | 90 |
| Fig. 2. | *A. callippe* Bdv. ♀, Griffith Park, Los Angeles, Cal. June 1, 1920 | 90 |
| Fig. 3. | *A. callippe* Bdv. ♂, under side, Los Angeles, Cal. June 1, 1920 | 90 |
| Fig. 4. | *A. snyderi californica* Skin. ♂, Carmel, Monterey Co., Cal. July 7, 1921 | 87 |
| Fig. 5. | *A. snyderi californica* Skin. ♀, Carmel, Monterey Co., Cal. July 7, 1921 | 87 |
| Fig. 6. | *A. snyderi californica* Skin. ♀, under side, Carmel, Monterey Co., Cal. July 7, 1921 | 87 |
| Fig. 7. | *A. coronis* Behr ♂, Mt. St. Helena, Napa Co., Cal. No date. Courtesy James E. Cottle | 91 |
| Fig. 8. | *A. coronis* Behr ♀, Mt. St. Helena, Napa Co., Cal. No date. Courtesy James E. Cottle | 91 |
| Fig. 9. | *A. rupestris* Behr ♂, Shasta Co., Cal. July 5, 1921 | 91 |
| Fig. 10. | *A. rupestris* Behr ♀, Shasta Co., Cal. July 5, 1921 | 91 |
| Fig. 11. | *A. rupestris* Behr ♀, under side, No. Cal. No date. Courtesy James E. Cottle | 91 |


1
CALLIPPE FRITILLARY
Argynnis callippe ♂
2
CALLIPPE FRITILLARY
Argynnis callippe ♀
3
CALLIPPE FRITILLARY
Under side ♂
4
CALIFORNIA FRITILLARY
Argynnis californica ♂
5
CALIFORNIA FRITILLARY
Argynnis californica ♀
6
CALIFORNIA FRITILLARY
Under side. ♀
7
CORONIS FRITILLARY
Argynnis coronis ♂
8
CORONIS FRITILLARY
Argynnis coronis ♀
9
RUPESTRIS FRITILLARY
Argynnis rupestris ♂
10
RUPESTRIS FRITILLARY
Argynnis rupestris. ♀
11
RUPESTRIS FRITILLARY
A. rupestris under side ♀

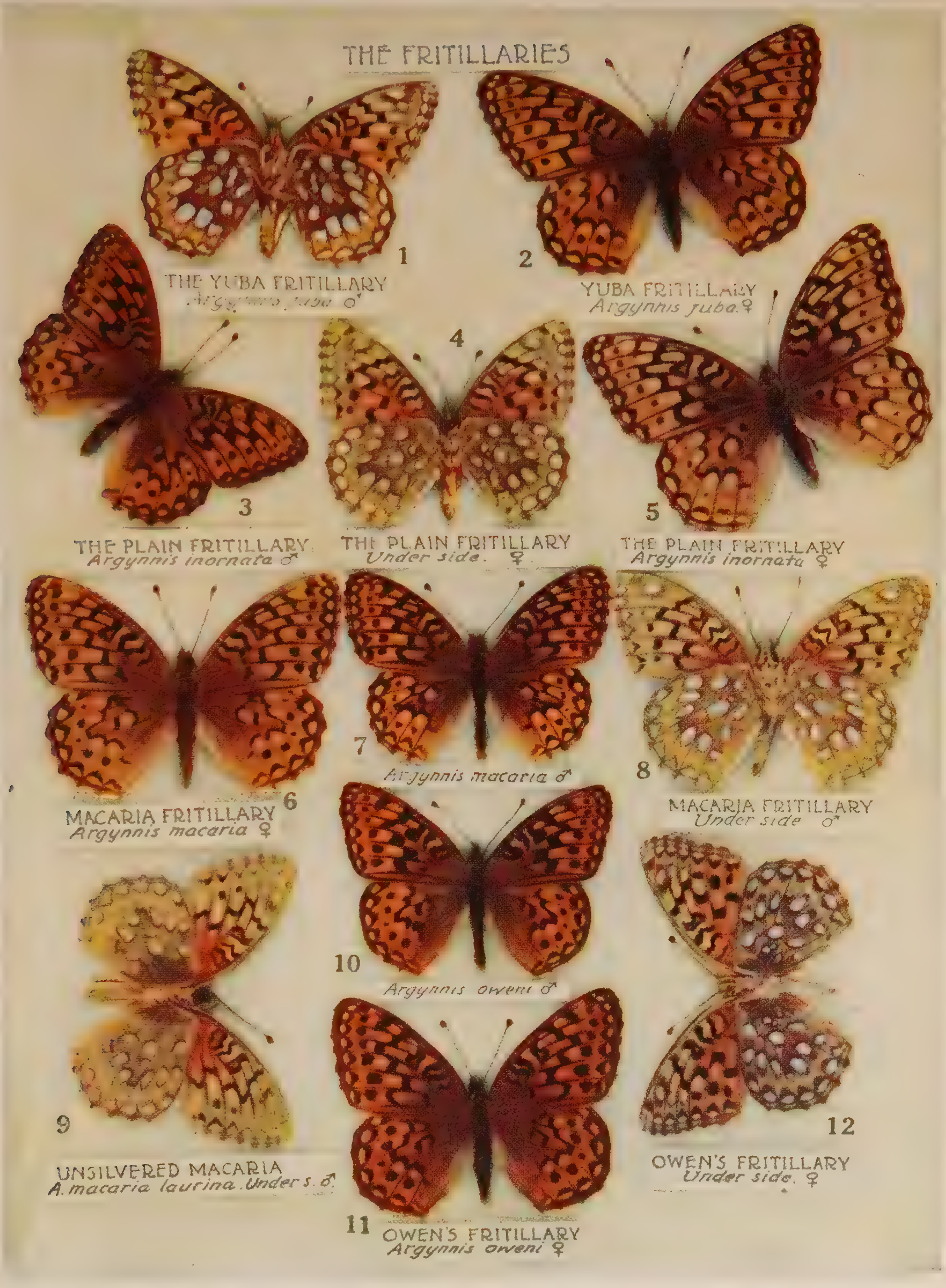
THE FRITILLARIES

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 30

| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis juba* Bdv. ♂, Alturas, Modoc Co., Cal. No date. Courtesy James E. Cottle | 91 |
| Fig. 2. | *A. juba* Bdv. ♀, Alturas, Modoc Co., Cal. No date. Courtesy James E. Cottle | 91 |
| Fig. 3. | *A. juba inornata* Edw. ♂, Alturas, Modoc Co., Cal. No date. Courtesy J. E. Cottle | 92 |
| Fig. 4. | *A. juba inornata* Edw. ♀, under side, Shasta Co., Cal., June 30, 1921 | 92 |
| Fig. 5. | *A. juba inornata* Edw. ♀, Wawona near Yosemite, Cal., July 5, 1921 | 92 |
| Fig. 6. | *A. macaria* Edw. ♀, Bouquet Canyon, Los Angeles Co., Cal., June 3, 1923 | 92 |
| Fig. 7. | *A. macaria* Edw. ♂, Ridge Route, Sierra Madre Mts., Cal., June 21, 1923 | 92 |
| Fig. 8. | *A. macaria* Edw. ♂, under side, Mt. Pinos, Kern Co., Cal., June 7, 1904 | 92 |
| Fig. 9. | *A. macaria laurina* Wright. ♂, under side, Cedar Creek, Cal., May 26, 1920 | 92 |
| Fig. 10. | *A. montivaga oweni* Edw. ♂, Mt. Shasta, Siskiyou Co., Cal., Aug. 8, 1923 | 94 |
| Fig. 11. | *A. montivaga oweni* Edw. ♀, Mt. Shasta, Siskiyou Co., Cal., Aug. 8, 1923 | 94 |
| Fig. 12. | *A. montivaga oweni* Edw. ♀, under side, Mt. Shasta, Siskiyou Co., Cal., Aug. 5, 1923 | 94 |

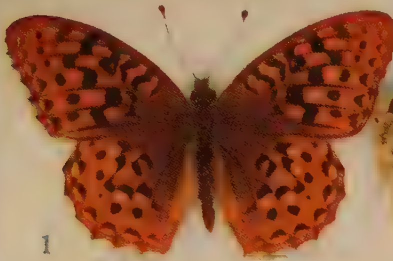

THE FRITILLARIES
1
THE YUBA FRITILLARY
Argynnis juba ♂
2
YUBA FRITILLARY
Argynnis juba ♀
3
THE PLAIN FRITILLARY
Argynnis inornata ♂
4
THE PLAIN FRITILLARY
Under side. ♀
5
THE PLAIN FRITILLARY
Argynnis inornata ♀
6
MACARIA FRITILLARY
Argynnis macaria ♀
7
Argynnis macaria ♂
8
MACARIA FRITILLARY
Under side ♂
9
UNSILVERED MACARIA
A. macaria laurina. Under s. ♂
10
Argynnis oweni ♂
11
OWEN'S FRITILLARY
Argynnis oweni ♀
12
OWEN'S FRITILLARY
Under side. ♀

All figures slightly reduced

Copyright 1927, John A. Comstock

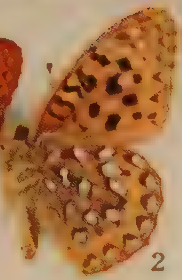
## EXPLANATION OF PLATE 31

| | | Text Page |
|---|---|---|
| Fig. 1. | *Argynnis montivaga malcolmi* Comst. ♂. Mammoth, Mono Co. Cal. Aug. 18, 1918. Type | 94 |
| Fig. 2. | *A. montivaga malcolmi* Comst. ♂, under side. Casa Diablo, Mono Co. Cal. July 22, 1919. Paratype | 94 |
| Fig. 3. | *A. montivaga malcolmi* Comst. ♀. Mammoth, Mono Co., Cal. Aug. 18, 1918. Paratype | 94 |
| Fig. 4. | *A. montivaga* Behr ♂. Glacier Point, Yosemite, Cal. July 2, 1921 | 92 |
| Fig. 5. | *A. montivaga* Behr ♀. Truckee, Cal. July 6, 1918 | 92 |
| Fig. 6. | *A. montivaga* Behr ♂, under side. Mammoth, Mono Co. Cal. July 26, 1922 | 92 |
| Fig. 7. | *A. mormonia* Bdv. ♂. Monache Meadows, Tulare Co. Cal. Aug. 7, 1917 | 95 |
| Fig. 8. | *A. mormonia* Bdv. ♂, under side. Tioga Pass, above Yosemite, Cal. Aug. 3, 1922 | 95 |
| Fig. 9. | *A. mormonia* Bdv. ♀. Monache Meadows, Tulare Co. Cal. Aug. 7, 1917 | 95 |
| Fig. 10. | *A. montivaga tehachapina* Comst. ♂. Tehachapi Mts. Cal. July 18, 1918. Holotype | 94 |
| Fig. 11. | *A. montivaga tehachapina* Comst. ♀, under side. Tehachapi Mts. Cal. July 18, 1918. Allotype | 94 |
| Fig. 12. | *A. montivaga tehachapina* Comst. ♂, under side. Tehachapi Mts. Cal. July 18, 1918 Paratype | 94 |



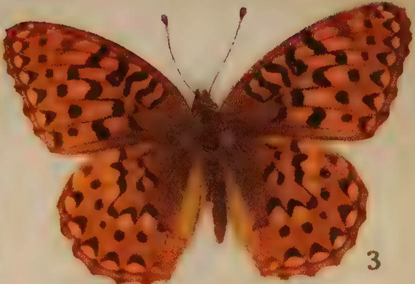
1

MALCOLM'S FRITILLARY
*Argynnis malcolmi* ♂



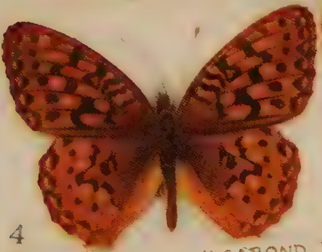
2

MALCOLM'S FRITILLARY
*Argynnis malcolmi Under s* ♂.



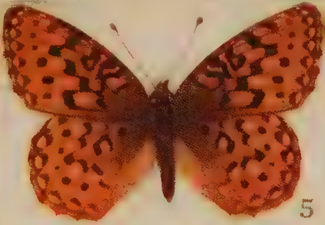
3

MALCOLM'S FRITILLARY.
*Argynnis malcolmi* ♀



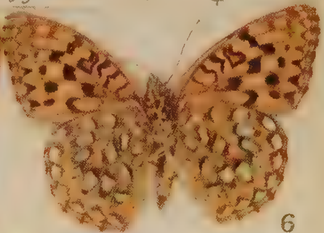
4

THE MOUNTAIN VAGABOND
*Argynnis montivaga* ♂



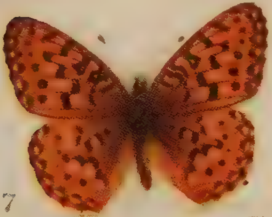
5

THE MOUNTAIN VAGABOND
*Argynnis montivaga* ♀



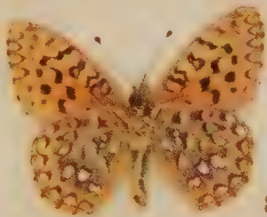
6

THE MOUNTAIN VAGABOND
*A. montivaga. Under s.* ♂.



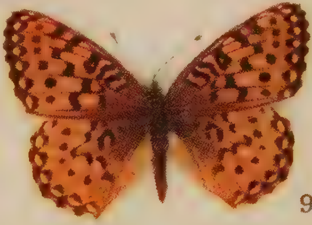
7

THE MORMON FRITILLARY
*Argynnis mormonia* ♂



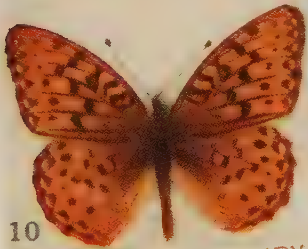
8

THE MORMON FRITILLARY
*Under side* ♂.



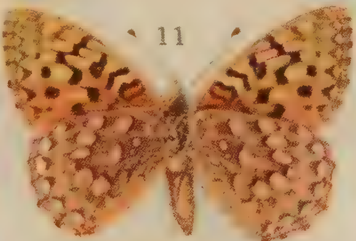
9

THE MORMON FRITILLARY
*Argynnis mormonia* ♀



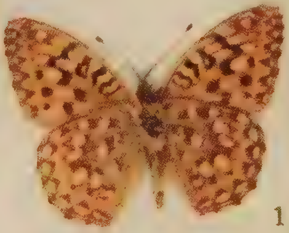
10

TEHACHAPI FRITILLARY
*Argynnis tehachapina* ♂



11

THE TEHACHAPI FRITILLARY
*Argynnis tehachapina Under s.* ♀



12

TEHACHAPI FRITILLARY
*Under side* ♂.

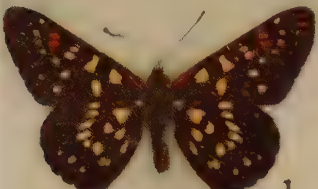
THE FRITILLARIES

All figures slightly reduced

Copyright 1927, John A. Comstock

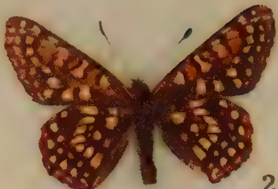
# EXPLANATION OF PLATE 33

| | | Text Page |
|---|---|---|
| Fig. 1. | *Euphydryas chalcedona dwinelli* Hy. Edw. ♂. Upper Soda Springs, Siskiyou Co. Cal. June. Courtesy of J. E. Cottle | 99 |
| Fig. 2. | *E. chalcedona macglashanii* Rivers ♂. Truckee, Cal. May 1, 1896 | 99 |
| Fig. 3. | *E. chalcedona olancha* Wright ♂. Olancha Peak, Inyo Co. Cal. No date. Courtesy of J. E. Cottle | 100 |
| Fig. 4. | *E. colon* ab. *huellemanni* Comst. ♀. Allotype. Wallace. Idaho. June 15, 1919 | 100 |
| Fig. 5. | *E. colon* ab. *huellemanni* Comst. ♂. Holotype. Wallace, Idaho. June 12, 1921 | 100 |
| Fig. 6. | *E. chalcedona olancha* Wright ♀. Casa Diablo Hot Springs, Mono Co. Cal. July 5, 1922. Courtesy of George Malcolm | 100 |
| Fig. 7. | *E. colon* Edw. ♂. Ft. Klamath, Ore. June 9, 1914 | 100 |
| Fig. 8. | *E. colon* Edw. ♂, under side. Ft. Klamath, Ore. June 9, 1914 | 100 |
| Fig. 9. | *E. colon* Edw. ♀. Wallace, Idaho. June 15, 1918 | 100 |
| Fig. 10. | *E. baroni* Edw. ♂. Mendocino Co. Cal. May 23, 1918 | 100 |
| Fig. 11. | *E. baroni* Edw. ♀, under side. Mendocino Co. Cal. May 23, 1918 | 100 |
| Fig. 12. | *E. baroni* Edw. ♀. Mendocino Co. Cal. May 23, 1918 | 100 |



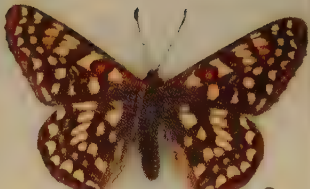
1

DWINELL'S CHECKER SPOT
*E. chalcedona dwinelli* ♂



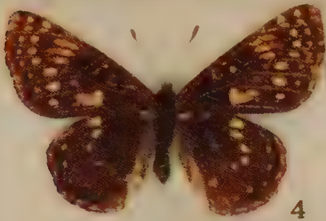
2

MACGLASHAN'S CHECKER SPOT
*E. chalcedona macglashani* ♂



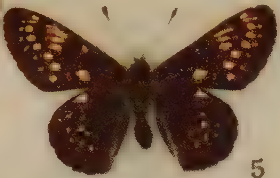
3

OLANCHA CHECKER SPOT
*E. chalcedona olancha.* ♂



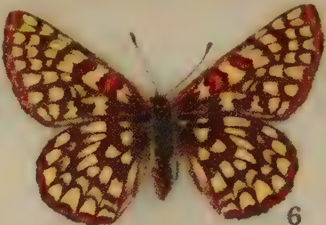
4

HUELLEMANN'S CHECKER SPOT
*E. colon huellemanni* ♀



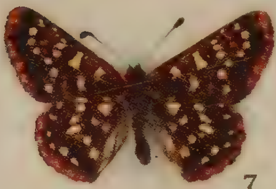
5

HUELLEMANN'S CHECKER SPOT
*E. colon huellemanni* ♂.



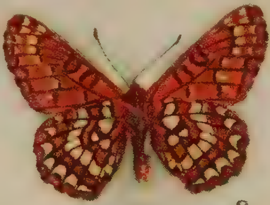
6

OLANCHA CHECKER SPOT
*E. chalcedona olancha.* ♀



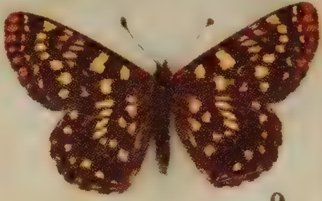
7

EDWARD'S CHECKER SPOT
*Euphydryas colon.* ♂



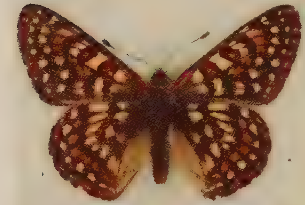
8

*E. colon*
*Under side*



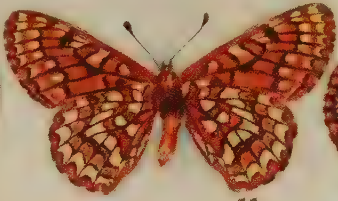
9

EDWARD'S CHECKER SPOT
*Euphydryas colon.* ♀



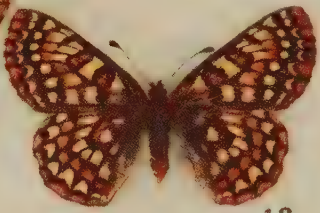
10

BARON'S CHECKER SPOT
*Euphydryas baroni* ♂



11

*E. baroni*
*Under side.*



12

BARON'S CHECKER SPOT
*Euphydryas baroni.* ♀

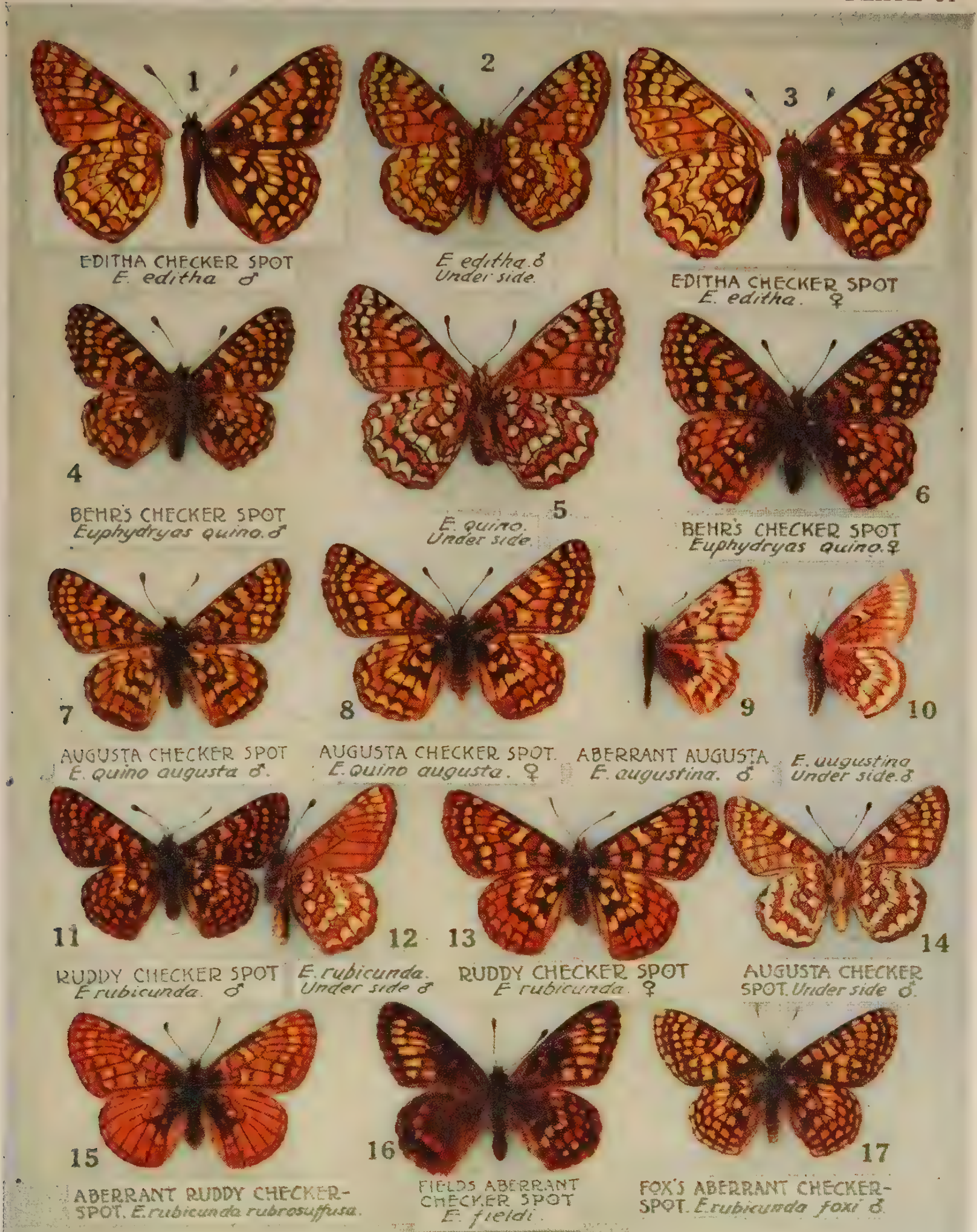
THE CHECKER SPOTS

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 34

| | | Text Page |
|---|---|---|
| Fig. 1. | *Euphydryas editha* Bdv. ♂, the left half of fig. showing under side. From Oberthur's illustration, "Etudes Lep. Comp.," Vol. IX, Part 2, Fig. 2171 | 101 |
| Fig. 2. | *E. editha* Bdv. ♂, under side. Zaca, near Santa Barbara, Cal. April 10, 1923 | 101 |
| Fig. 3. | *E. editha* Bdv. ♀, the left half of figure showing under side. From Oberthur's illustration, "Etudes Lep. Comp.," Vol. IX, Part 2, Fig. 2172 | 101 |
| Fig. 4. | *E. quino* Behr ♂. Orange Co. Park, Cal. April 7, 1918 | 102 |
| Fig. 5. | *E. quino* Behr ♀, under side. Orange Co. Park, Cal. March 27, 1921 | 102 |
| Fig. 6. | *E. quino* Behr ♀. Orange Co. Park, Cal. March 27, 1921 | 102 |
| Fig. 7. | *E. quino augusta* Edw. ♂. San Bernardino Mts., Cal. June 16, 1922. Courtesy J. Gunder | 103 |
| Fig. 8. | *E. quino augusta* Edw. ♀. San Bernardino Mts., Cal. June 16, 1922. Courtesy J. Gunder | 103 |
| Fig. 9. | *E. quino augusta* ab. *augustina* Wright ♂. From illustration, Wright's "Butterf. of the W. Coast." Plate XIX, Fig. 170 | 103 |
| Fig. 10. | *E. quino augusta* ab. *augustina* Wright ♂, under side, from illus. Wright's "Butterfl. of the W. Coast." Plate XIX, Fig. 170a | 103 |
| Fig. 11. | *E. rubicunda* Hy. Edw. ♂. Gold Lake, Sierra Co., Cal. July 17, 1921 | 103 |
| Fig. 12. | *E. rubicunda* Hy. Edw. ♂, under side. Hutington Lake, Cal. Courtesy Dr. F. C. Clark | 103 |
| Fig. 13. | *E. rubicunda* Hy. Edw. ♀. Gold Lake, Sierra Co., Cal. July 14, 1921 | 103 |
| Fig. 14. | *E. quino augusta* Edw. ♂, under side. San Bernardino Mts., Cal. June 16, 1922 | 103 |
| Fig. 15. | *E. rubicunda* ab. *rubrosuffusa* Comst. ♀. Mammoth Camp, Mono Co., Cal. July 28, 1921. Type. Courtesy George Malcolm | 104 |
| Fig. 16. | *E. quino* ab *fieldi* Gunder ♂. San Diego, Cal. April 26, 1920. Type. Courtesy Jean Gunder | 103 |
| Fig. 17. | *E. rubicunda* ab. *foxi* Gunder ♂. Gold Lake, Sierra Co., Cal. July 13, 1921. Paratype. Courtesy Jean Gunder | 104 |


1
EDITHA CHECKER SPOT
E. editha ♂
2
E. editha ♂
Under side
3
EDITHA CHECKER SPOT
E. editha. ♀
4
BEHR'S CHECKER SPOT
Euphydryas quino ♂
5
E. quino.
Under side
6
BEHR'S CHECKER SPOT
Euphydryas quino ♀
7
AUGUSTA CHECKER SPOT
E. quino augusta ♂.
8
AUGUSTA CHECKER SPOT.
E. quino augusta. ♀
9
ABERRANT AUGUSTA
E. augustina. ♂
10
E. augustina
Under side ♂
11
RUDDY CHECKER SPOT
E. rubicunda. ♂
12
E. rubicunda.
Under side ♂
13
RUDDY CHECKER SPOT
E. rubicunda. ♀
14
AUGUSTA CHECKER
SPOT. Under side ♂.
15
ABERRANT RUDDY CHECKER-
SPOT. E. rubicunda rubrosuffusa.
16
FIELDS ABERRANT
CHECKER SPOT
E. fieldi.
17
FOX'S ABERRANT CHECKER-
SPOT. E. rubicunda foxi ♂.

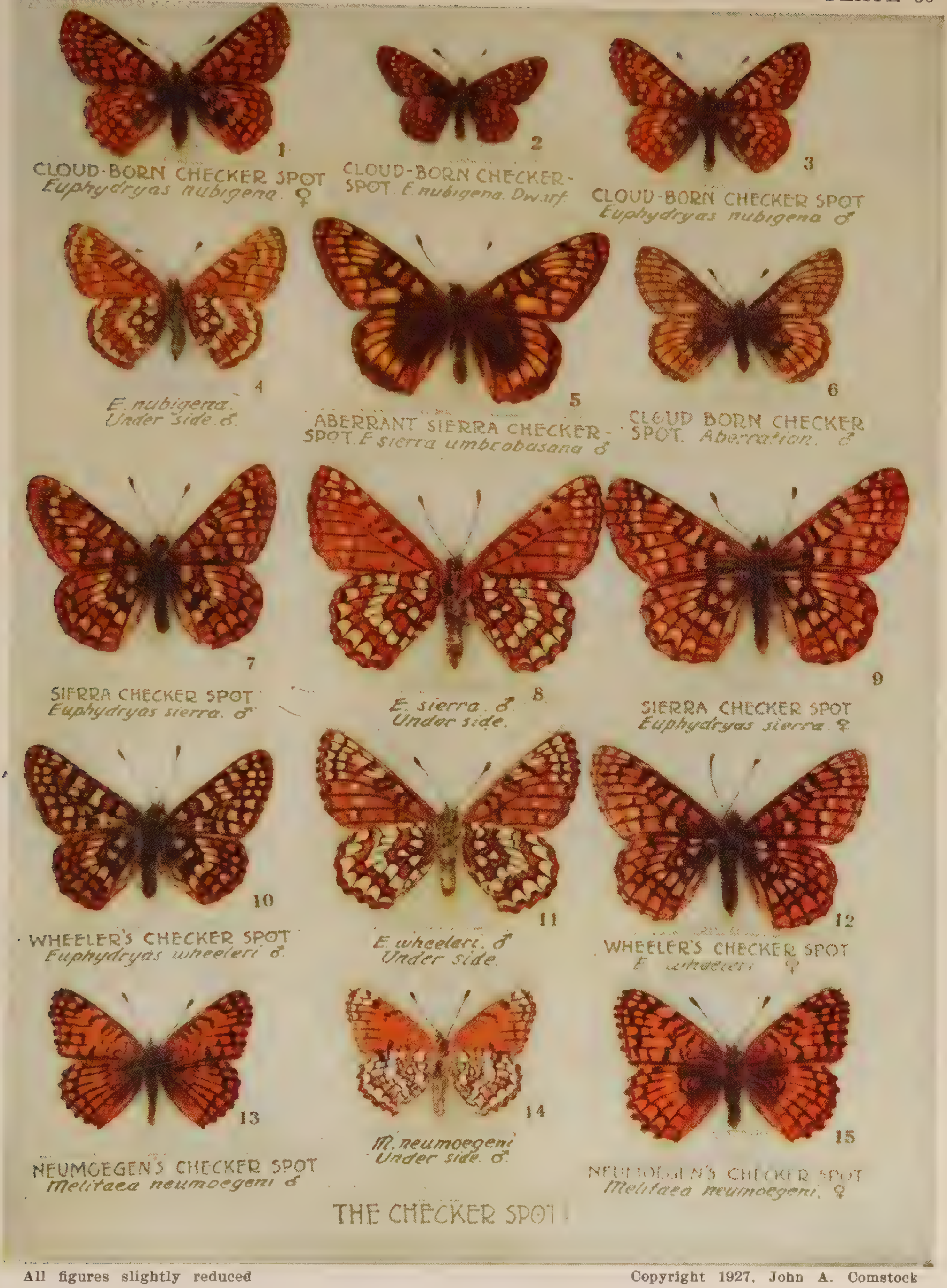
THE CHECKER SPOTS

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 35

| | | Text Page |
|---|---|---|
| Fig. 1. | *Euphydryas nubigena* Behr ♀, Tioga Pass above Yosemite, Cal. August 3, 1922 | 104 |
| Fig. 2. | *E. nubigena* Behr ♂, dwarf. No data. Courtesy Jean Gunder | 104 |
| Fig. 3. | *E. nubigena* Behr ♂, Tioga Pass above Yosemite, Cal. August 3, 1922 | 104 |
| Fig. 4. | *E. nubigena* Behr ♂, under side, Tioga Pass above Yosemite, Cal. August 3, 1922 | 104 |
| Fig. 5. | *E. sierra* ab. *umbrobasana* Gunder ♂, Lake Tahoe region. July, 1922. Type | 105 |
| Fig. 6. | *E. nubigena* Behr ♀, (aberration) Tioga Pass above Yosemite, Cal. August 3, 1922 | 104 |
| Fig. 7. | *E. sierra* Wright ♂, Glacier Point, Yosemite, Cal. July 4, 1921 | 105 |
| Fig. 8. | *E. sierra* Wright ♂, under side, Gold Lake, Sierra Co., Cal. July 13, 1921 | 105 |
| Fig. 9. | *E. sierra* Wright ♀, Glen Alpine Cr. Eldorado Co., Cal., July 15, 1909 | 105 |
| Fig. 10. | *E. wheeleri* Hy. Edw. ♂, Mono Lake, Cal. June 16, 1917 | 106 |
| Fig. 11. | *E. wheeleri* Hy. Edw. ♂, under side, Eureka, Utah. May 24, 1920 | 106 |
| Fig. 12. | *E. wheeleri* Hy. Edw. ♀, Washington Co., Utah. April 27, 1919 | 106 |
| Fig. 13. | *Melitæa neumoegeni* Skin. ♂, Mojave Desert, Cal. April 16, 1923 | 106 |
| Fig. 14. | *M. neumoegeni* Skin. ♂, under side, Mojave Desert, Cal. April 16, 1923 | 106 |
| Fig. 15. | *M. neumoegeni* Skin. ♀, Mojave Desert, Cal. May 7, 1923 | 106 |



1 CLOUD-BORN CHECKER SPOT *Euphydryas nubigena.* ♀

2 CLOUD-BORN CHECKER-SPOT. *E. nubigena. Dwarf.*

3 CLOUD-BORN CHECKER SPOT *Euphydryas nubigena* ♂

4 *E. nubigena.* Under side. ♂.

5 ABERRANT SIERRA CHECKER-SPOT. *E. sierra umbrobasana* ♂

6 CLOUD BORN CHECKER SPOT. Aberration. ♂

7 SIERRA CHECKER SPOT *Euphydryas sierra.* ♂

8 *E. sierra.* ♂. Under side.

9 SIERRA CHECKER SPOT *Euphydryas sierra.* ♀

10 WHEELER'S CHECKER SPOT *Euphydryas wheeleri* ♂.

11 *E. wheeleri.* ♂ Under side.

12 WHEELER'S CHECKER SPOT *E. wheeleri* ♀

13 NEUMOEGEN'S CHECKER SPOT *Melitaea neumoegeni* ♂

14 *M. neumoegeni* Under side. ♂.

15 NEUMOEGEN'S CHECKER SPOT *Melitaea neumoegeni.* ♀

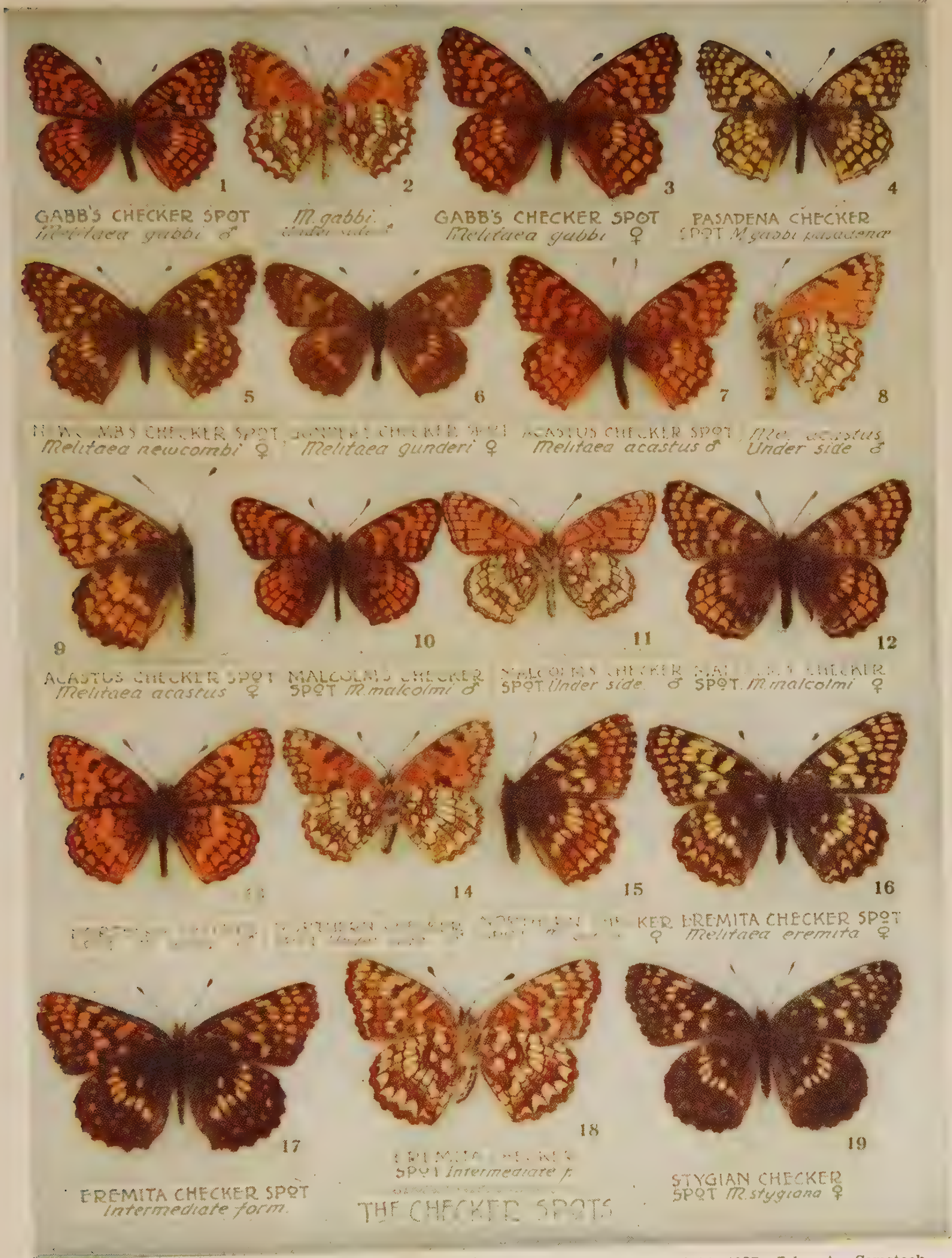
THE CHECKER SPOT

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 36

| | | Text Page |
|---|---|---|
| Fig. 1. | *Melitæa gabbii* Behr ♂, Mint Canyon, Los Angeles Co., Cal. April 30, 1923 | 108 |
| Fig. 2. | *M. gabbii* Behr ♂, under side, San Bernardino Mts., Cal., June 25, 1919 | 108 |
| Fig. 3. | *M. gabbii* Behr ♀, San Gabriel Mts., Cal. June 6, 1921 | 108 |
| Fig. 4. | *M. gabbii* ab. *pasadenæ* Gunder ♂, Pasadena, Cal., May 20, 1921. Type. Courtesy Jean Gunder | 108 |
| Fig. 5. | *M. gabbii* ab. *newcombi* Comst. ♀, near Pasadena, Cal. April 7, 1907. Type | 108 |
| Fig. 6. | *M. gabbii* ab. *gunderi* Comst. ♂, (Not ♀, as marked on plate) San Fernando, Cal. April 6, 1919. Type | 108 |
| Fig. 7. | *M. acastus* Edw. ♂, Mono Lake, Mono Co., Cal. June 19, 1917 | 110 |
| Fig. 8. | *M. acastus* Edw. ♂, under side, Reno, Nev. May 9, 1908 | 110 |
| Fig. 9. | *M. acastus* Edw. ♀, Eureka, Utah. June 8, 1920 | 110 |
| Fig. 10. | *M. malcolmi* Comst. ♂, Mammoth, Mono, Co., Cal. July 27, 1921. Holotype. Courtesy George Malcolm | 110 |
| Fig. 11. | *M. malcomi* Comst. ♂, under side, Mammoth, Mono Co., Cal. July 27, 1921. Paratype | 110 |
| Fig. 12. | *M. malcolmi* Comst. ♀, Mammoth, Mono Co., Cal. July 27, 1921. Allotype. Courtesy George Malcolm | 110 |
| Fig. 13. | *M. palla* Bdv. ♂, Tehachapi Mts., Cal. July 1, 1921 | 109 |
| Fig. 14. | *M. palla* Bdv. ♂, under side, Tehachapi Mts., Cal. July 1, 1921 | 109 |
| Fig. 15. | *M. palla* Bdv. ♀, Tehachapi Mts., Cal. July 1, 1921 | 109 |
| Fig. 16. | *M. palla eremita* Wright ♀, Ridge Route, Sierra Madre Mts., Cal. May 27, 1923. Courtesy George Malcolm | 109 |
| Fig. 17. | *M. palla eremita* Wright ♀, intermediate form. Willow Ranch, Modoc Co., Cal. June 8, 1924 | 109 |
| Fig. 18. | *M. palla eremita* Wright ♀, intermediate form, under side, Portola, Cal.. May 18, 1907 | 109 |
| Fig. 19. | *M. palla stygiana* Comst. ♀, Willow Ranch, Modoc Co., Cal. June 9, 1924. Type. Courtesy Jean Gunder | 110 |


1
GABB'S CHECKER SPOT
Melitaea gabbi ♂
2
M. gabbi.
Under side ♂
3
GABB'S CHECKER SPOT
Melitaea gabbi ♀
4
PASADENA CHECKER
SPOT M. gabbi pasadena
5
NEWCOMB'S CHECKER SPOT
Melitaea newcombi ♀
6
GUNDER'S CHECKER SPOT
Melitaea gunderi ♀
7
ACASTUS CHECKER SPOT
Melitaea acastus ♂
8
Me. acastus
Under side ♂
9
ACASTUS CHECKER SPOT
Melitaea acastus ♀
10
MALCOLM'S CHECKER
SPOT M. malcolmi ♂
11
MALCOLM'S CHECKER
SPOT Under side ♂
12
MALCOLM'S CHECKER
SPOT M. malcolmi ♀
13
14
15
NORTHERN CHECKER
♀
16
EREMITA CHECKER SPOT
Melitaea eremita ♀
17
EREMITA CHECKER SPOT
Intermediate form.
18
EREMITA CHECKER
SPOT Intermediate f.
19
STYGIAN CHECKER
SPOT M. stygiana ♀

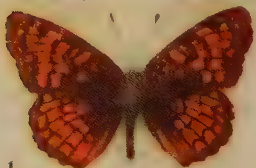
THE CHECKER SPOTS

All figures slightly reduced

Copyright 1927, John A. Comstock

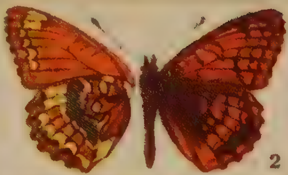
## EXPLANATION OF PLATE 37

| | | Text Page |
|---|---|---|
| Fig. 1. | *Melitæa palla whitneyi* Behr ♂. Fallen Leaf Lake near Lake Tahoe, Cal. Aug. 8, 1922 | 111 |
| Fig. 2. | *M. palla* ab. *wardi* Oberth. ♂. Reproduced from Oberthur's illustration, "Etudes Lep. Comp." Vol. IX. Part 2, Fig. 2175 | 110 |
| Fig. 3. | *M. palla whitneyi* Behr ♀. Wallace, Idaho. June 18, 1919. | 111 |
| Fig. 4. | *M. hoffmanni* Behr ♀. Mt. Tallac trail, near Fallen Leaf Lake, Cal. July 30, 1916 | 111 |
| Fig. 5. | *M. hoffmanni* Behr ♂. Glacier Point, Yosemite, Cal. July 2, 1921 | 111 |
| Fig. 6. | *M. hoffmanni* Behr ♂, under side, Glacier Point, Yosemite, Cal. July 2, 1921 | 111 |
| Fig. 7. | *M. hoffmanni* ab. *abnorma* Wright. Under side, from illustration, "Butterflies of the West Coast," Pl. XX, fig. 183-b | 112 |
| Fig. 8. | *M. hoffmanni* ab. *abnorma* Wright, from illustration, "Butterflies of the West Coast," Pl. XX, fig. 183 | 112 |
| Fig. 9. | *M. hoffmanni segregata* B. & McD. ♂. Crater Lake, Ore. Aug. 2, 1923 | 112 |
| Fig. 10. | *M. hoffmanni segregata* B. & McD. ♀. Crater Lake, Ore. Aug. 2, 1923 | 112 |
| Fig. 11. | *M. hoffmanni segregata* B. & McD. ♂, under side, Crater lake, Ore. Aug. 2, 1923 | 112 |
| Fig. 12. | *M. chara* ab. *jacintoi* Gunder. ♂. type. Palm Springs, Riverside Co. Cal. May 28, 1922. Courtesy Jean Gunder. | 112 |
| Fig. 13. | *M. chara* ab. *nitela* Comst. ♂. type. Near Palm Springs, Riverside Co., Cal. April 5, 1921 | 113 |
| Fig. 14. | *M. chara* Edw. ♂. Palm Springs, Cal. April 5, 1921 | 112 |
| Fig. 15. | *M. chara* Edw. ♂, under side. Chino Wash near Palm Springs, Cal. April 6, 1920 | 112 |
| Fig. 16. | *M. chara* Edw. ♀. Palm Springs, Cal. April 6, 1920 | 112 |
| Fig. 17. | *M. leanira* F. & F. ♂. San Francisco, Cal., 1902 | 113 |
| Fig. 18. | *M. leanira* F. & F. ♂, under side, San Francisco, Cal., 1902 | 113 |
| Fig. 19. | *M. leanira* F. & F. ♀. Fairfax, Marin Co. Cal. June 26, 1919 | 113 |
| Fig. 20. | *M. leanira obsoleta* Hy. Edw. ♂, intermediate form. Fairfax, Marin Co. Cal. June 8, 1920 | 113 |
| Fig. 21. | *M. leanira obsoleta* Hy. Edw. ♂. Fairfax, Marin Co. Cal. June 8, 1919 | 113 |



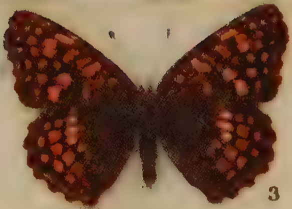
1

WHITNEY'S CHECKER SPOT
*Melitaea whitneyi* ♂



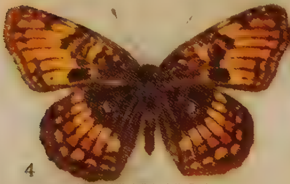
2

WARD'S ABERRANT CHECKER
SPOT *Mel. paila wardi* ♂



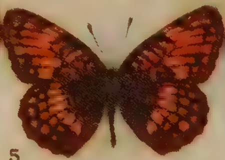
3

WHITNEY'S CHECKER SPOT
*Melitaea whitneyi.* ♀



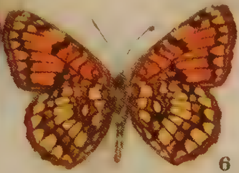
4

HOFFMANN'S CHECKER
SPOT. *M. hoffmanni* ♀



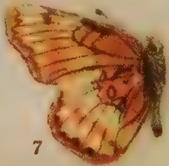
5

HOFFMANN'S CHECKER
SPOT. *M. hoffmanni* ♂.



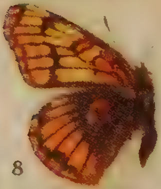
6

HOFFMANN'S CHECKER
SPOT. *Under side.* ♂.



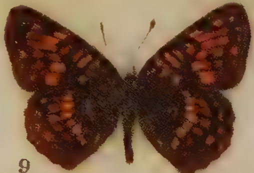
7

ABNORMAL CHECKER
SPOT *Under side.*

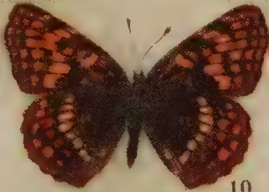


8

ABNORMAL CHECKER
SPOT *M. hoffmanni abnorma.*

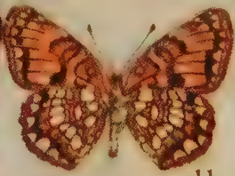


9



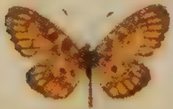
10

♂ SEGREGATED CHECKER ♀
SPOT *M hoffmanni segregata.*



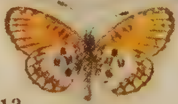
11

SEGREGATED CHECKER
SPOT *Under side.* ♂



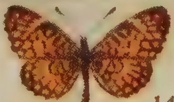
12

SAN JACINTO CHECKER
SPOT *M. chara jacintoi.* ♂.



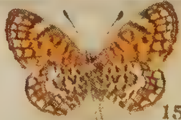
13

THE LUSTROUS CHECKER
SPOT. *M chara ab. nitela* ♂.



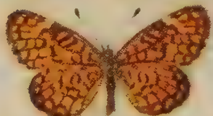
14

CHARA CHECKER
SPOT. *M. chara* ♂



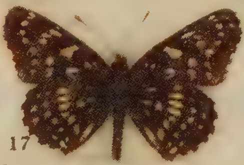
15

CHARA CHECKER
SPOT. *Under side.* ♂



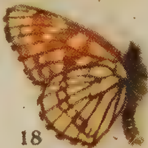
16

CHARA CHECKER SPOT
*Melitaea chara.* ♀



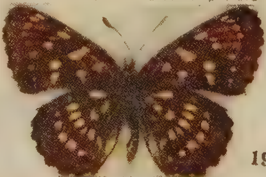
17

LEANIRA CHECKER
SPOT *M. leanira* ♂.



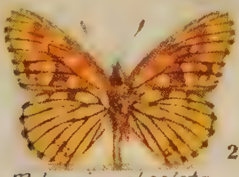
18

LEANIRA CHECKER
SPOT *Under side.* ♂.



19

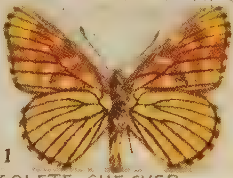
LEANIRA CHECKER
SPOT. *M leanira.* ♀



20

*M leanira obsoleta*
*Intermediate form.* ♂.

THE
CHECKER
SPOTS.



21

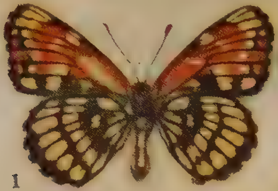
OBSOLETE CHECKER
SPOT *M. leanira obsoleta* ♂

All figures slightly reduced

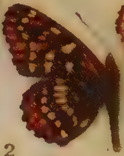
Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 38

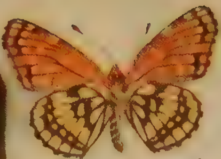
| | | Text Page |
|---|---|---|
| Fig. 1. | *Melitæa leanira* f. *leona* Wright. ♀, under side, Mint Canyon, Los Angeles Co. Cal. May 1, 1921 | 113 |
| Fig. 2. | *M. leanira wrightii* Edw. ♂, Mint Canyon, L. A. Co. Cal. May 1, 1921 | 114 |
| Fig. 3. | *M. leanira wrightii* Edw. ♂, under side, La Canada near Pasadena, Cal. July 17, 1917 | 114 |
| Fig. 4. | *M. leanira wrightii* Edw. ♀, Mint Canyon, L. A. Co. Cal. May 1, 1921 | 114 |
| Fig. 5. | *M. leanira wrightii* Edw. ♀, slightly aberrant, Mint Canyon, L. A. Co. Cal. April 30, 1923 | 114 |
| Fig. 6. | *M. leanira wrightii* ab. *cerrita* Wright. ♂, Mint Canyon, L. A. Co. Cal. May 1, 1921 | 114 |
| Fig. 7. | *M. leanira wrightii* ab. *cerrita* Wright. ♀, Mint Canyon, L. A. Co. Cal. May 16, 1920 | 114 |
| Fig. 8. | *M. alma* Stkr. ♂, Mojave Desert, Cal. April 16, 1923 | 114 |
| Fig. 9. | *M. alma* Stkr. ♀, Pyramid Lake, Nev. June 3, 1910 | 114 |
| Fig. 10. | *M. alma* Stkr. ♂, under side, Mojave Desert, Cal. April 16, 1923 | 114 |
| Fig. 11. | *M. pola monache* Comst. ♂, (type) Monache Meadows, Tulare Co. Cal. Aug. 3, 1917 | 115 |
| Fig. 12. | *M. pola monache* Comst. ♀, (type) Monache Meadows, Tulare Co. Cal. Aug. 3, 1917 | 115 |
| Fig. 13. | *Chlosyne californica* Wright. ♂, Palm Springs, Cal. March 27, 1916 | 120 |
| Fig. 14. | *Melitæa pola monache* Comst. ♂, under side, Monache Meadows, Tulare Co. Cal. Aug. 7, 1917 | 115 |
| Fig. 15. | *Chlosyne californica* ab. *chinoi* Gunder. ♀. Reproduced from figure of type | 120 |
| Fig. 16. | *C. californica* Wright. ♀, Chino Canyon, Coachella Valley, Cal. April 1, 1922 | 120 |
| Fig. 17. | *C. californica* Wright. ♂, under side, Palm Springs, Cal. March 27, 1916 | 120 |
| Fig. 18. | *C. californica* Wright. ♀, slightly aberrant, Palm Springs, Cal. April 1, 1916. | 120 |


1

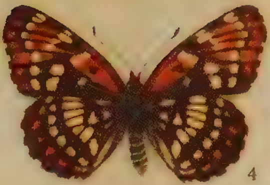
LEONA CHECKER SPOT M. leanira leona ♀


2

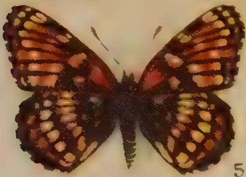
WRIGHT'S CHECKER SPOT M. wrighti ♂


3

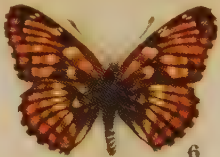
WRIGHT'S CHECKER SPOT *Under side* ♂


4

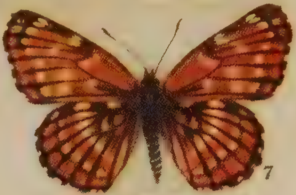
WRIGHT'S CHECKER SPOT. *M. wrighti* ♀


5

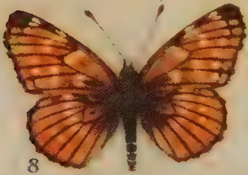
WRIGHT'S CHECKER SPOT. *Aberrant* ♀


6

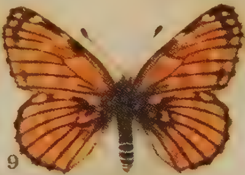
CERRITA CHECKER SPOT. *M. cerrita* ♂


7

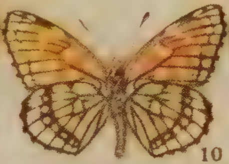
CERRITA CHECKER SPOT *M. cerrita* ♀


8

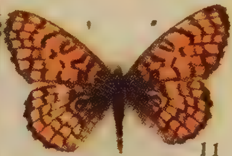
ALMA CHECKER SPOT *Melitaea alma* ♂


9

ALMA CHECKER SPOT *M. alma* ♀

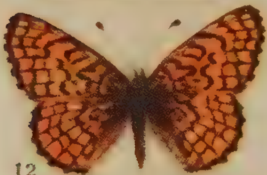

10

ALMA CHECKER SPOT *Under side* ♂

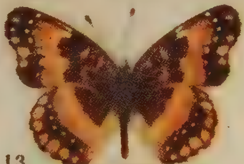

11

MONACHE CHECKER SPOT *M. pola monache* ♂

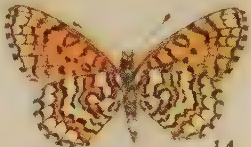
## THE CHECKER SPOTS


12

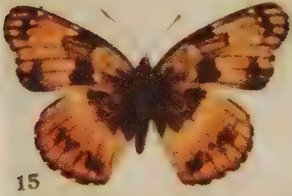
MONACHE CHECKER SPOT. *M. pola monache.* ♀


13

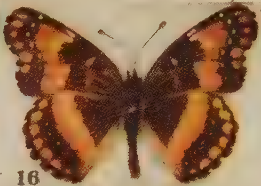
THE CALIFORNIA PATCH. *C. californica.* ♂


14

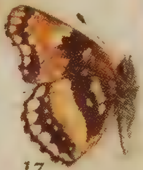
MONACHE CHECKER SPOT. *Under side.* ♂


15

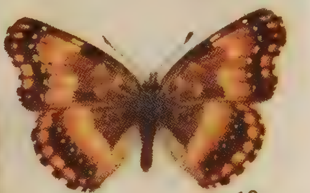
THE CHINO PATCH *Chlos. ab. chinoi.* ♀


16

THE CALIFORNIA PATCH *Chlosyne californica* ♀


17

THE CALIFORNIA PATCH. *Under side* ♂


18

THE CALIFORNIA PATCH *Intermediate form*

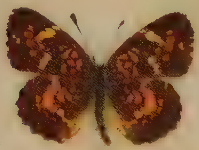
## THE PATCHED BUTTERFLIES

All figures slightly reduced

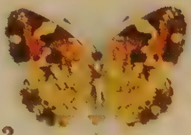
Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 39

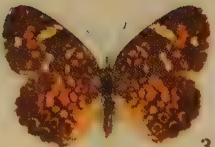
| | | Text Page |
|---|---|---|
| Fig. 1. | *Phyciodes phaon* Edw. ♂. Fertilla, So. Cal. July 30, 1921. | 116 |
| Fig. 2. | *P. phaon* Edw. ♂, under side. Fertilla, So. Cal. July 29, 1921 | 116 |
| Fig. 3. | *P. phaon* Edw. ♀. Fertilla, So. Cal. July 29, 1921 | 116 |
| Fig. 4. | *P. campestris* Behr ♂. Glacier Point, Yosemite, Cal. July 2, 1921 | 116 |
| Fig. 5. | *P. campestris* Behr ♀. Willow Ranch, Buck Creek, Modoc Co., Cal. May 28, 1924 | 116 |
| Fig. 6. | *P. campestris* Behr ♂, under side. Glacier Point, Yosemite, Cal. July 2, 1921 | 116 |
| Fig. 7. | *P. montana* Behr ♂. Lake Tahoe, Cal. July 1, 1915 | 116 |
| Fig. 8. | *P. montana* Behr ♀. Tioga Pass above Yosemite, Cal. Aug. 3, 1922 | 116 |
| Fig. 9. | *P. orseis* Edw. ♂. Eldredge, Sonoma Co. Cal. May 16, 1917 | 117 |
| Fig. 10. | *P. orseis* Edw. ♂, under side, Eldredge, Sonoma Co. Cal. June 2, 1917 | 117 |
| Fig. 11. | *P. orseis* Edw. ♀. Fairfax Canyon, Marin Co. Cal. March. Courtesy of J. E. Cottle | 117 |
| Fig. 12. | *P. orseis* Edw. ♀, aberrant form. "Calif." Courtesy of Dr. Wm. Barnes | 117 |
| Fig. 13. | *P. mylitta* Edw. ♂. San Bernardino Mts. Cal. June 25, 1919 | 117 |
| Fig. 14. | *P. mylitta* Edw. ♂, under side, San Bernardino Mts. Cal. June, 1920 | 117 |
| Fig. 15. | *P. mylitta* Edw. ♀. Prosser, Wash. April 25, 1921 | 117 |
| Fig. 16. | *P. mylitta* Edw. ♂, (aberrant form resembling *P. barnesi* Skin.) Collins Ranch, Voltaire, Cal. Aug. 12, 1923. Courtesy of J. Gunder | 117 |
| Fig. 17. | *Chlosyne lacinia* Gey. ♂. Beeville, Texas. Oct., 1920 | 119 |
| Fig. 18. | *C. lacinia* Gey. ♂, under side. Beeville, Texas. Oct., 1920. | 119 |
| Fig. 19. | *C. lacinia crocale* Edw. ♂. Ray, Ariz. June 15, 1920 | 119 |
| Fig. 20. | *C. lacinia rufescens* Edw. ♂. Calexico, Cal. 1920. Courtesy of Jean Gunder | 119 |
| Fig. 21. | *C. lacinia nigrescens* Ckll. ♂. Calexico, Cal. 1920 | 120 |



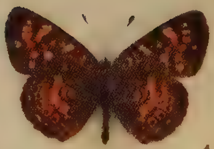
1 PHAON CRESCENT
*Phyciodes phaon* ♂



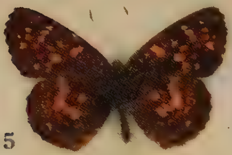
2 PHAON CRESCENT
*Under side.* ♂



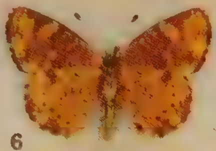
3 PHAON CRESCENT
*Phyc phaon* ♀



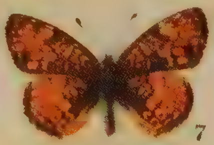
4 THE FIELD CRESCENT
*Phyciodes campestris* ♂



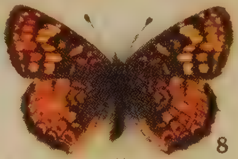
5 THE FIELD CRESCENT
*Phyc. campestris* ♀



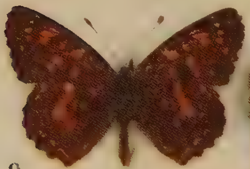
6 THE FIELD CRESCENT
*Under side.* ♂.



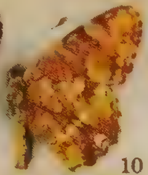
7 MOUNTAIN CRESCENT
*Phyc. montana* ♂



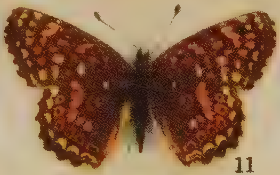
8 MOUNTAIN CRESCENT
*Phyc. montana.* ♀



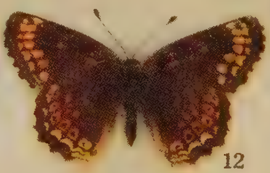
9 ORSEIS CRESCENT
*Phyc orseis* ♂



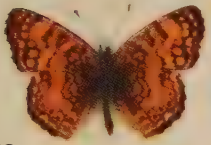
10 ORSEIS CRESCENT
*Under side* ♂



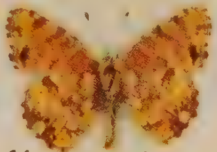
11 ORSEIS CRESCENT
*Phyc orseis.* ♀



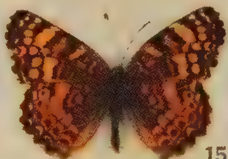
12 ORSEIS CRESCENT
*Aberrant* ♀



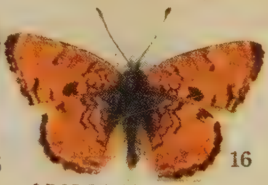
13 MYLITTA CRESCENT
*Phyc. mylitta* ♂.



14 MYLITTA CRESCENT
*Under side.* ♂.

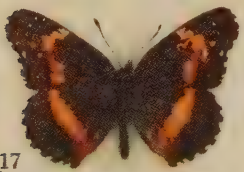


15 MYLITTA CRESCENT
*Phyc. mylitta.* ♀

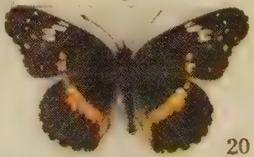


16 ABERRANT MYLITTA
*Phyc. mylitta* ♂

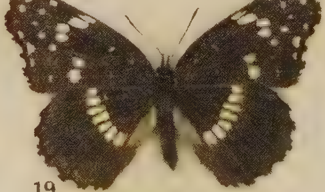
THE CRESCENT SPOTS



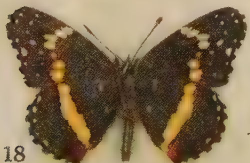
17 THE BORDERED PATCH
*Chlosyne lacinia* ♂



20 RUFESCENT PATCH
*C. lacinia rufescens* ♂

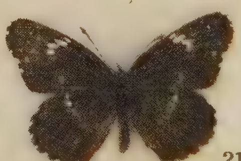


19 CROCALE PATCH
*Chlosyne crocale.* ♀



18 THE BORDERED PATCH. *Under side.* ♂

THE PATCHED BUTTERFLIES



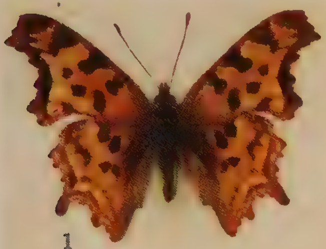
21 THE DUSKY PATCH
*C. lacinia nigrescens.* ♂.

All figures slightly reduced

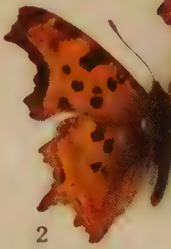
Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 40

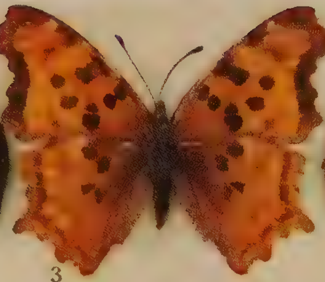
| | | Text Page |
|---|---|---|
| Fig. 1. | *Polygonia satyrus* Edw. ♂. Highland Park, Los Angeles, Cal. May, 1913 | 121 |
| Fig. 2. | *P. satyrus* Edw. ♂. Tehachapi, Cal. July 11, 1918 | 121 |
| Fig. 3. | *P. satyrus* Edw. ♀. Tehachapi, Cal. July 11, 1918 | 121 |
| Fig. 4. | *P. satyrus* Edw. ♂, under side, Tehachapi, Cal. Aug. 18, 1918 | 121 |
| Fig. 5. | *P. satyrus marsyas* Edw. ♂. Wallace, Idaho. July 11, 1907. | 122 |
| Fig. 6. | *P. satyrus marsyas* Edw. ♀. Clackamas Co. Ore. July 27, 1918 | 122 |
| Fig. 7. | *P. satyrus marsyas* Edw. ♂, under side, San Luis Obispo, Cal. | 122 |
| Fig. 8. | *P. satyrus chrysoptera* Wright. ♀. Tehachapi, Cal. July 7, 1918 | 122 |
| Fig. 9. | *P. hylas* Edw. ♂. Gores Range, Colo. Aug. 21, 1902 | 123 |
| Fig. 10. | *P. satyrus chrysoptera* Wright, ♀, under side, Tehachapi, Cal. July 7, 1918 | 122 |
| Fig. 11. | *P. faunus rusticus* Edw. ♂, under side. Plumas Co. Cal. Aug. 1, 1923 | 122 |
| Fig. 12. | *P. hylas* Edw. ♂, under side. Gores Range, Colo. Aug. 21, 1902 | 123 |
| Fig. 13. | *P. faunus rusticus* Edw. ♂. Clackamas Co., Ore. July 1919 | 122 |


1

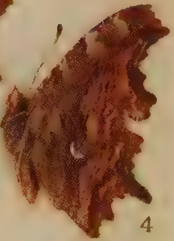
THE SATYR
*Polygonia satyrus* ♂


2

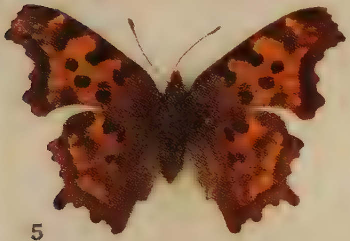
THE SATYR
*P. satyrus* ♂


3

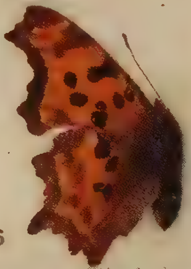
THE SATYR
*P. satyrus* ♀


4

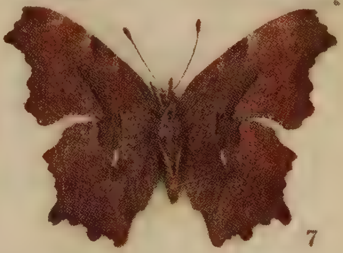
THE SATYR
*Under side.* ♂


5

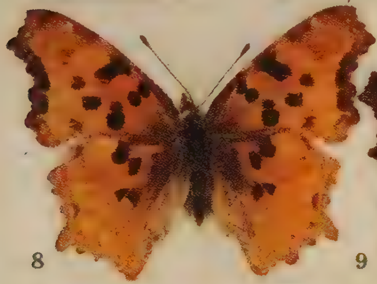
MARSYAS ANGLE-WING *P. satyrus marsyas* ♂


6

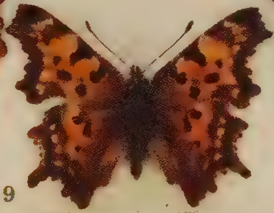
MARSYAS ANGLE-WING *P. satyrus marsyas* ♀


7

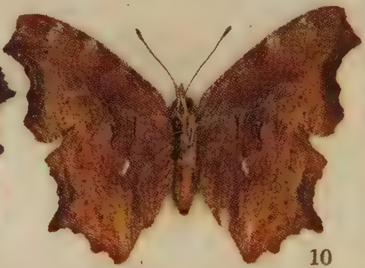
MARSYAS ANGLE WING. *Under side.* ♂


8

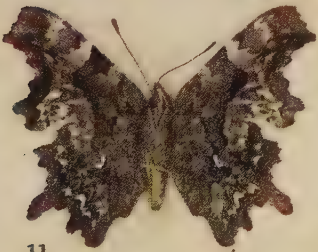
THE GOLDEN-WING
*P. satyrus chrysoptera.* ♀


9

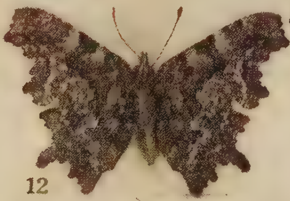
COLORADO ANGLE-WING.
*P. hylas.* ♂


10

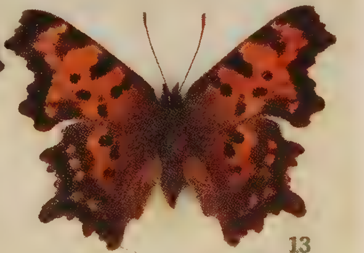
THE GOLDEN-WING. *Under side.*


11

RUSTIC ANGLE WING. *Under side.* ♂


12

COLORADO ANGLE-WING
*Under side.* ♂


13

RUSTIC ANGLE-WING
*P. faunus rusticus.* ♂

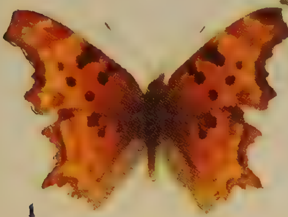
# THE ANGLE-WINGS

All figures slightly reduced

Copyright 1927, John A. Comstock

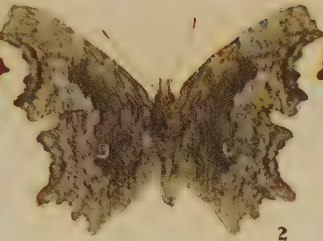
## EXPLANATION OF PLATE 41

| | | Text Page |
|---|---|---|
| Fig. 1. | *Polygonia zephyrus* Edw. ♂. Turkey Creek Canyon, Colo. July 6, 1902 | 123 |
| Fig. 2. | *P. zephyrus* Edw. ♂, under side. Cranbrook, B. C. Oct 10, 1911 | 123 |
| Fig. 3. | *P. zephyrus* Edw. ♀. Cranbrook, B. C. Sept. 13, 1910 | 123 |
| Fig. 4. | *P. oreas silenus* Edw. ♂. Clackamas Co. Ore. July 27, 1919 | 124 |
| Fig. 5. | *P. oreas silenus* Edw. ♀. Clackamas Co. Ore. July 27, 1919 | 124 |
| Fig. 6. | *P. oreas silenus* Edw. ♂, under side, Clackamas Co. Ore. May 19, 1919 | 124 |
| Fig. 7. | *Aglais californica* Bdv. ♂. Mt. Wilson, Cal. June 25, 1919. | 124 |
| Fig. 8. | *A. californica* Bdv. ♂, under side. Mt. Wilson, Cal. June 25, 1919 | 124 |
| Fig. 9. | *A. milberti* Godt. ♂, under side, Skagway, Alaska. July 1923 | 125 |
| Fig. 10. | *A. milberti* Godt. ♂. Kaslo, B. C., Canada. Aug. 15, 1900. | 125 |
| Fig. 11. | *A. milberti subpallida* Ckll. ♂. Alberta, B. C. Canada. Aug., 1915 | 126 |



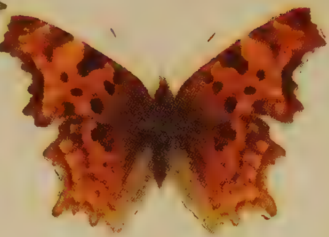
1

THE ZEPHYR
*P. zephyrus.* ♂



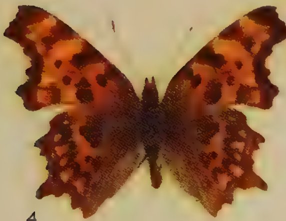
2

THE ZEPHYR
*Under side* ♂



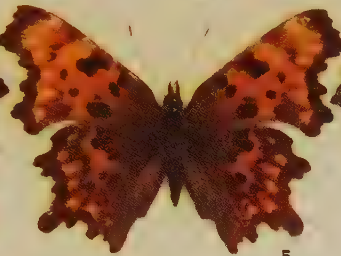
3

THE ZEPHYR
*P. zephyrus* ♀



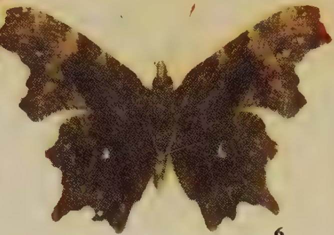
4

SILENUS ANGLE-WING. *P. silenus.* ♂



5

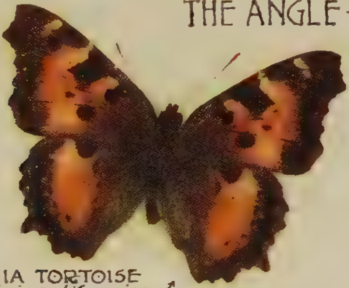
SILENUS ANGLE-WING. *P. silenus.* ♀



6

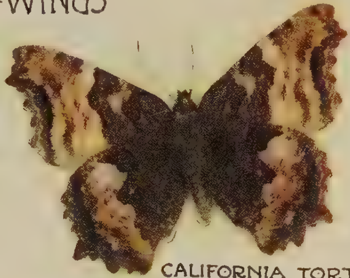
SILENUS ANGLE-WING. *Under side.* ♂

## THE ANGLE-WINGS



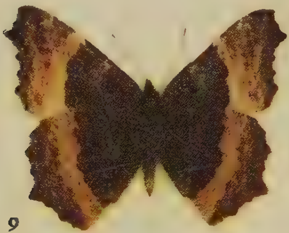
7

CALIFORNIA TORTOISE SHELL. *Aglais californica.* ♂



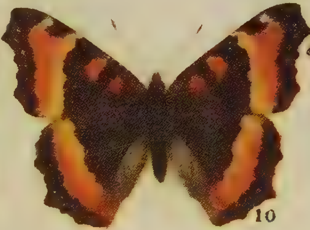
8

CALIFORNIA TORTOISE SHELL. *Under side.* ♂



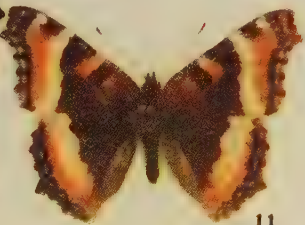
9

MILBERT'S TORTOISE SHELL. *Under side.* ♂



10

MILBERT'S TORTOISE SHELL. *A. milberti* ♂



11

COCKERELL'S TORTOISE SHELL. *A. milberti subpallida*

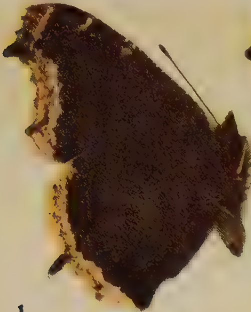
## THE TORTOISE SHELLS

All figures slightly reduced

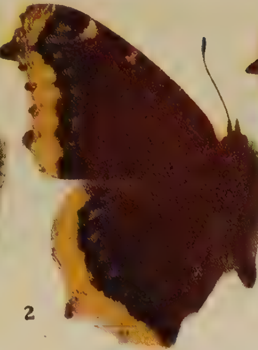
Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 42

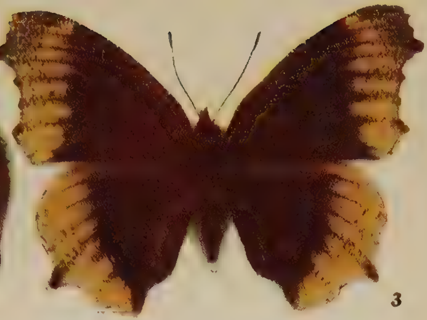
| | | Text Page |
|---|---|---|
| Fig. 1. | *Aglais antiopa* L. ♂, under side, Los Angeles, Cal. Aug. 6, 1922 | 126 |
| Fig. 2. | *A. antiopa* L. ♂, Los Angeles, Cal. Aug. 1, 1918 | 126 |
| Fig. 3. | *A. antiopa hygiæa* Heydenr. ♂, Tacoma, Wash. Sept. 10, 1916. Courtesy Jean Gunder | 126 |
| Fig. 4. | *A. antiopa grandis* Ehr. ♀, Staten Island. Oct. 3, 1908. Courtesy J. Gunder | 126 |
| Fig. 5. | *A. antiopa hygiæa* Heydenr. ♂, under side. New York State. Courtesy Drs. Barnes & Benjamin | 126 |
| Fig. 6. | *Vanessa virginiensis* ab. *ahwashtee* C. L. Fox. Drawn from type by R. F. Sternitzky | 133 |
| Fig. 7. | *V. cardui* L. ♂. Los Angeles, Cal. June 1, 1924. Slightly aberrant | 133 |
| Fig. 8. | *V. cardui* ab. *elymi* Ramb. ♂. Alameda, Cal. June. Courtesy J. E. Cottle | 134 |
| Fig. 9. | *V. virginiensis* ab. *fulvia* Dodge. ♂, (type). Louisiana, Mo. May 2, 1899. Courtesy E. A. Dodge | 132 |


1

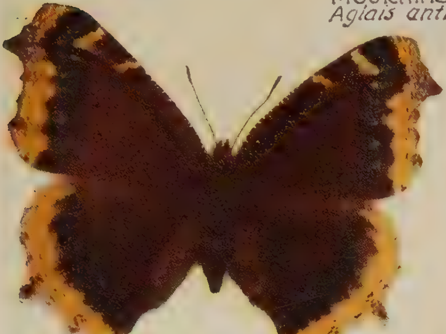
MOURNING-CLOAK
*Under side.* ♂


2

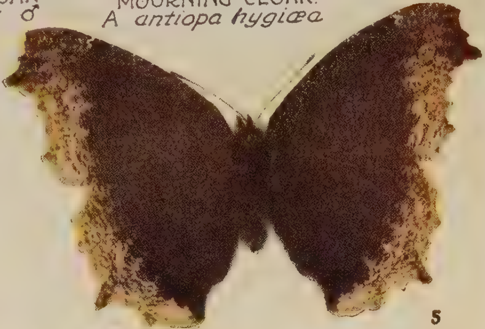
MOURNING-CLOAK
*Aglais antiopa* ♂


3

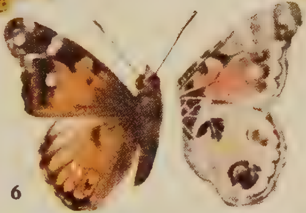
THE BROAD-BORDERED
MOURNING-CLOAK.
*A antiopa hygiæa*


4

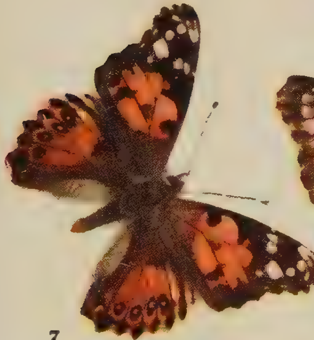
EHRMANN'S ABERRANT
MOURNING-CLOAK
*A. antiopa grandis.*


5

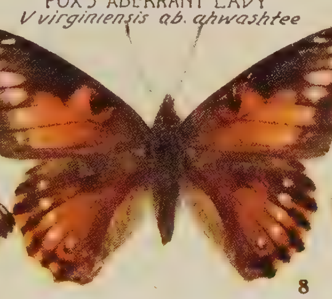
THE BROAD-BORDERED
MOURNING-CLOAK
*Under side* ♂


6

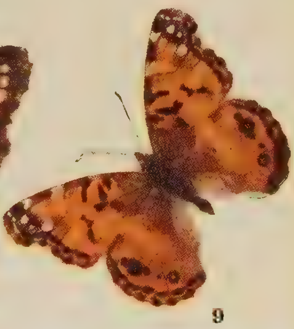
FOX'S ABERRANT LADY
*V virginiensis ab. ahwashtee*


7

THE PAINTED LADY
*Aberrant form.*


8

THE SUFFUSED LADY
*Vanessa cardui elymi.* ♂


9

DODGE'S ABERRANT LADY
*V. virginiensis ab. fulvia.* ♂

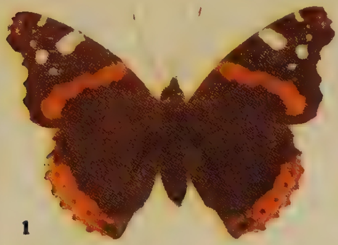
## THE TORTOISE-SHELLS & PAINTED LADIES

All figures slightly reduced

Copyright 1927, John A. Comstock

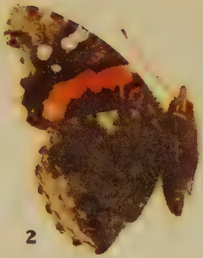
## EXPLANATION OF PLATE 43

| | | Text Page |
|---|---|---|
| Fig. 1. | *Vanessa atalanta* L. ♂. Monrovia, Cal. June 1, 1921 | 131 |
| Fig. 2. | *V. atalanta* L. ♂, under side. Fitzgerald, B. C. Canada. Aug. 28, 1921 | 131 |
| Fig. 3. | *V. virginiensis* Dru. ♂. Monache Meadows, Tulare Co. Cal. Aug. 7, 1917 | 132 |
| Fig. 4. | *V. atalanta* ab. *edwardsi* Grin. ♂. Type. San Francisco, Cal. Aug. Courtesy J. E. Cottle | 131 |
| Fig. 5. | *V. virginiensis* ab. *massachusettensis* Gunder ♂. Type. Southampton, Mass. July 20, 1923. Courtesy Jean Gunder | 133 |
| Fig. 6. | *V. virginiensis* Dru. ♀, under side. Los Angeles, Cal. Sept. 10, 1921 | 132 |
| Fig. 7. | *V. atalanta* ab. *edwardsi* Grin. ♂, under side. Altadena, Cal. July 30, 1914. Courtesy of Jean Gunder | 131 |
| Fig. 8. | *V. cardui* L. ♂, under side. Los Angeles, Cal. June 2, 1924 | 133 |
| Fig. 9. | *V. cardui* L. ♂. Los Angeles, Cal. June 21, 1924 | 133 |
| Fig. 10. | *Junonia coenia* ab. *schraderi* Gunder ♀. Type. Los Angeles, Cal. May 17, 1910. Courtesy of Jean Gunder | 138 |
| Fig. 11. | *J. coenia nigrosuffusa* B. & McD. ♂. Chiricahua Mts., Cochise Co. Ariz. June, 1908 | 138 |



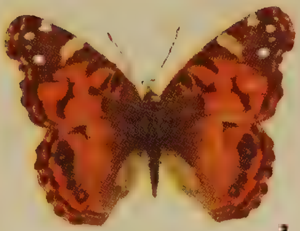
1

THE ALDERMAN BUTTERFLY
*Vanessa atalanta* ♂



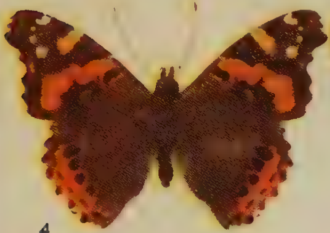
2

THE ALDERMAN BUTTERFLY
*Under side.*



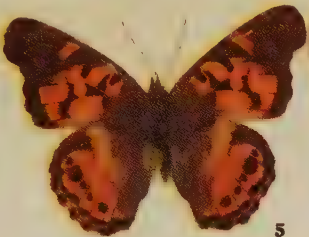
3

THE VIRGINIA LADY
*Vanessa virginiensis.* ♂



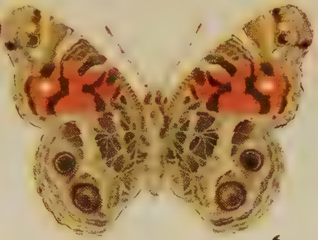
4

EDWARD'S PAINTED LADY
*V. atalanta edwardsi.* ♂



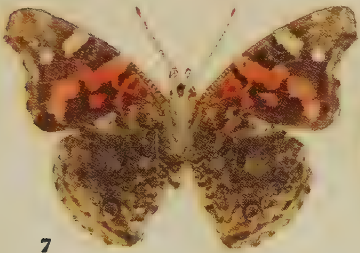
5

GUNDER'S ABERRANT LADY
*V. virginiensis massachusettensis.*



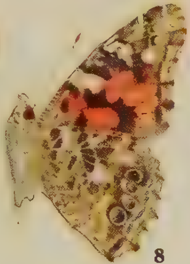
6

VIRGINIA LADY
*Under side.* ♀



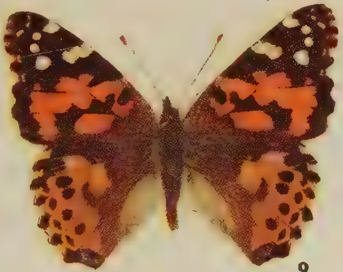
7

EDWARD'S PAINTED LADY
*Under-side.* ♂



8

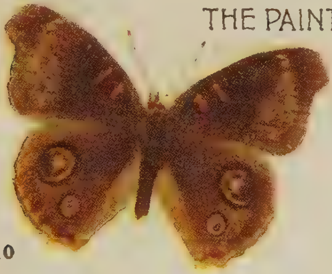
THE PAINTED LADY
*Under side* ♂.



9

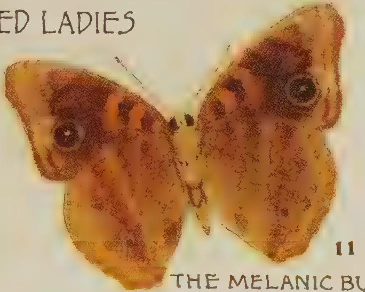
THE PAINTED LADY
*Vanessa cardui.* ♂

## THE PAINTED LADIES



10

SCHRADER'S ABERRANT
BUCKEYE. *Jun. ab. schraderi.*



11

THE MELANIC BUCKEYE
*Under side.*

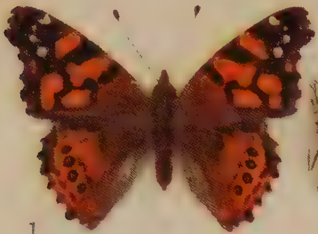
## THE PEACOCK BUTTERFLIES

All figures slightly reduced

Copyright 1927; John A. Comstock

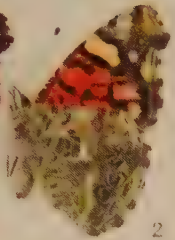
## EXPLANATION OF PLATE 44

| | | Text Page |
|---|---|---|
| Fig. 1. | *Vanessa carye* Hbn. ♂. Los Angeles, Cal. June 10, 1921.. | 134 |
| Fig. 2. | *V. carye* Hbn. ♀, under side. Skagway, Alaska. July, 1923. | 134 |
| Fig. 3. | *V. carye* Hbn. ♂. Lafayette Square, San Francisco, Cal. Aug., 1915. (albinic). Courtesy J. E. Cottle......... | 134 |
| Fig. 4. | *V. carye* ab. *intermedia* Grin. ♀ (type). San Francisco, Cal. No date. Courtesy J. E. Cottle................ | 135 |
| Fig. 5. | *V. carye* ab. *intermedia* Grin. ♂, under side. Los Angeles, Cal. July, 1921.................................. | 135 |
| Fig. 6. | *V. carye* ab. *muelleri* Letch. ♀. No data. Courtesy J. E. Cottle ........................................ | 135 |
| Fig. 7. | *V. carye* ab. *letcheri* Grin. ♂, (type). Castella, Shasta Co. Cal. June, 1913. Courtesy J. E. Cottle........... | 135 |
| Fig. 8. | *V. carye* ab. *letcheri* Grin. ♂, under side. Los Angeles, Cal. July 31, 1915............................... | 135 |
| Fig. 9. | *Junonia coenia* Hbn. ♂, Los Angeles, Cal. Sept., 1920.... | 136 |
| Fig. 10. | *J. coenia* Hbn. ♀, under side. Los Angeles, Cal. Sept., 1920. | 136 |
| Fig. 11. | *J. coenia nigrosuffusa* B. & McD. ♂. Cochise Co. Ariz. June 15, 1906.................................. | 138 |



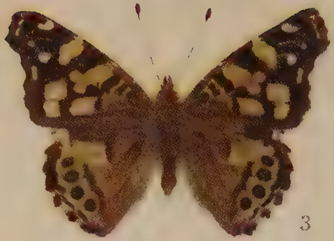
1

WEST COAST LADY
*Vanessa carye* ♂



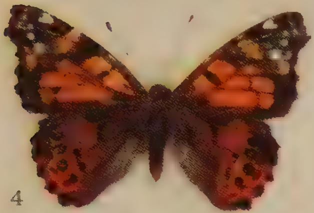
2

*Vanessa carye*
*Under side* ♀



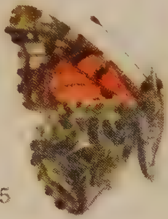
3

WEST COAST LADY
*Albinic form* ♂



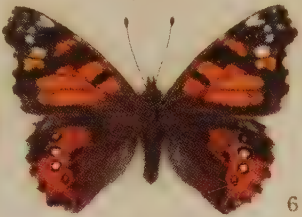
4

GRINNELL'S BUTTERFLY
*V. carye intermedia.*



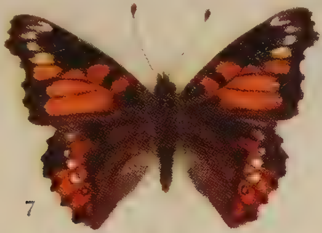
5

MUELLER'S BUTTERFLY
*Under side.*



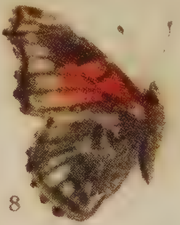
6

MUELLER'S BUTTERFLY
*V. carye muelleri.*



7

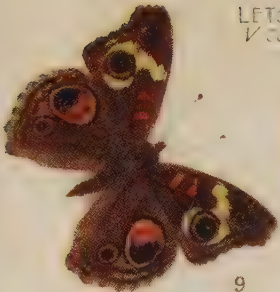
LETCHER'S BUTTERFLY
*V. carye letcheri* ♂



8

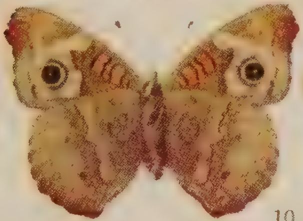
LETCHER'S BUTTERFLY
*Under side* ♂

THE PAINTED LADIES



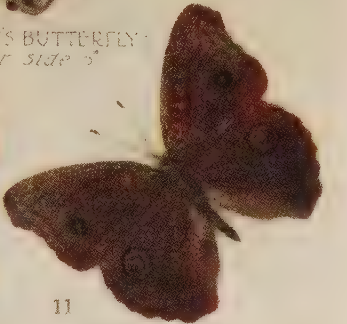
9

THE BUCKEYE
*Junonia coenia.* ♂



10

THE BUCKEYE
*Under side.* ♀



11

THE MELANIC BUCKEYE
*J. coenia nigrosuffusa*

PEACOCK BUTTERFLIES

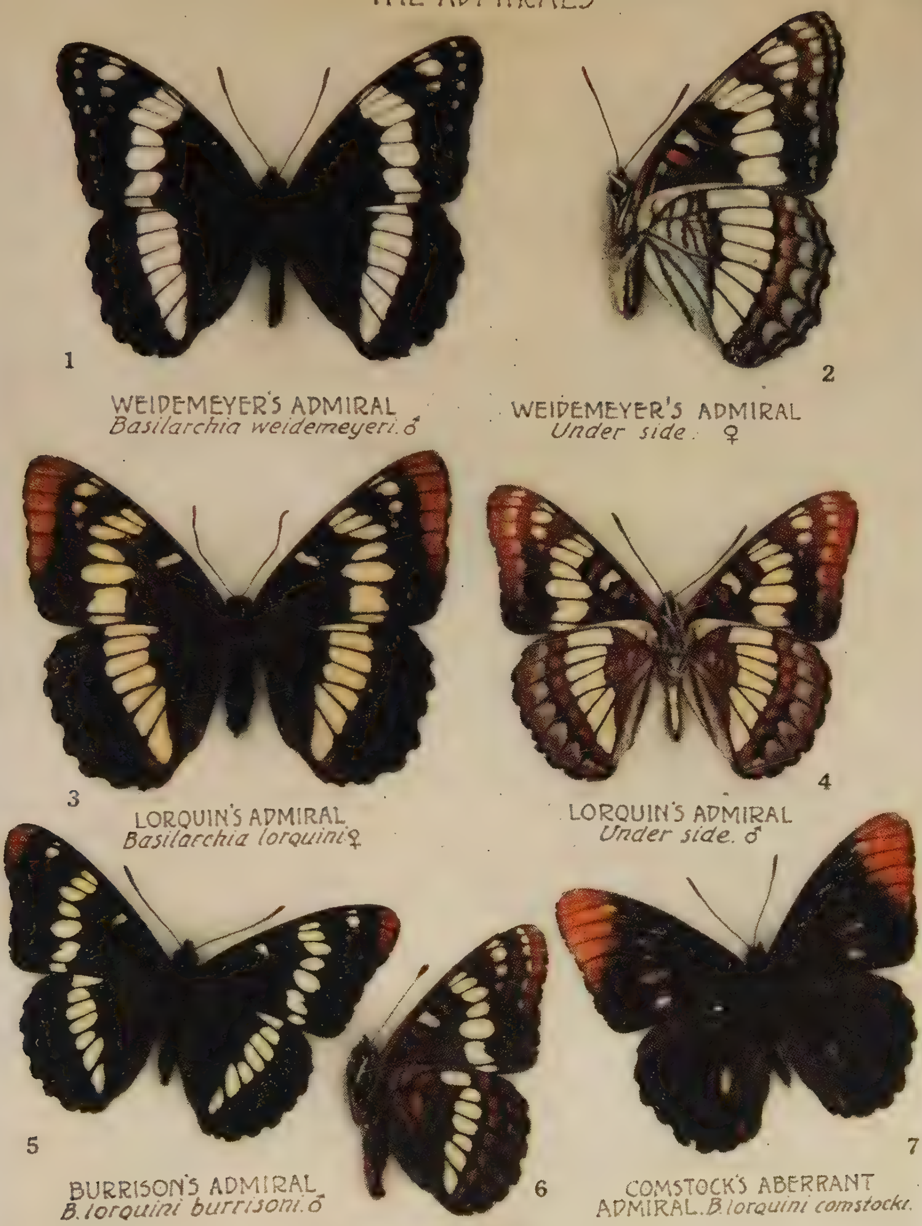
All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 45

| | | Text Page |
|---|---|---|
| Fig. 1. | *Basilarchia weidemeyrii* Edw. ♂, Warner Ranger Station, La Salle Mts. Utah. July 24, 1920 | 143 |
| Fig. 2. | *B. weidemeyrii* Edw. ♀, under side. Mono Lake, Cal. Aug. 5, 1922 | 143 |
| Fig. 3. | *B. lorquini* Bdv. ♀. Tehachapi, Cal. July 5, 1921 | 143 |
| Fig. 4. | *B. lorquini* Bdv. ♂, under side. Tehachapi, Cal. July 1, 1921. | 143 |
| Fig. 5. | *B. lorquini burrisonii* Mayn. ♂. Victoria, B. C. Can. June 19, 1919 | 145 |
| Fig. 6. | *B. lorquini burrisonii* Mayn. ♂, under side. Victoria, B. C. Canada. June 21, 1916 | 145 |
| Fig. 7. | *B. lorquini* ab. *comstocki* Gunder ♂, near Bishop, Inyo Co., Cal. Aug. 28, 1921. Holotype | 144 |

## THE ADMIRALS



1 WEIDEMEYER'S ADMIRAL
*Basilarchia weidemeyeri.* ♂

2 WEIDEMEYER'S ADMIRAL
*Under side.* ♀

3 LORQUIN'S ADMIRAL
*Basilarchia lorquini* ♀

4 LORQUIN'S ADMIRAL
*Under side.* ♂

5 BURRISON'S ADMIRAL
*B. lorquini burrisoni.* ♂

6 BURRISON'S ADMIRAL
*Under side.* ♂

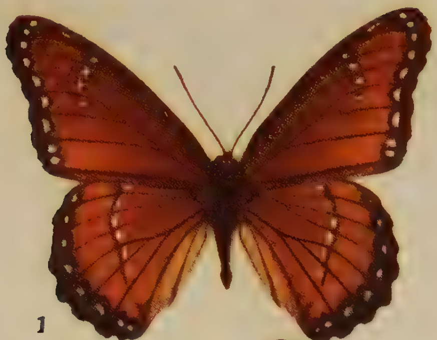
7 COMSTOCK'S ABERRANT
ADMIRAL. *B. lorquini comstocki.*

All figures slightly reduced

Copyright 1927, John A. Comstock

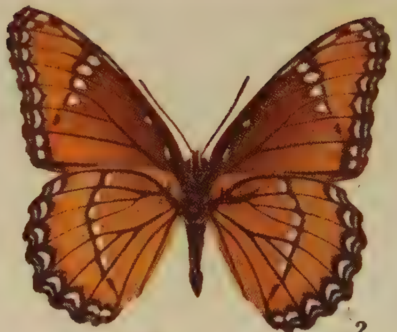
## EXPLANATION OF PLATE 46

| | | Text Page |
|---|---|---|
| Fig. 1. | *Basilarchia obsoleta* Edw. ♂, Blythe, Cal., April 10, 1921 | 145 |
| Fig. 2. | *B. obsoleta* Edw. ♂, under side, Blythe, Cal., April 10, 1921 | 145 |
| Fig. 3. | *Danaus berenice* Cram. ♀, Los Angeles, Cal., Sept. 29 1918, Shown here for comparison with Basilarchia obsoleta, on account of the imitative similarity | 60 |
| Fig. 4. | *Heterochroa bredowii californica* Butl. ♂, Tehachapi Mts., Cal., July 1, 1918 | 145 |
| Fig. 5. | *H. bredowii californica* Butl. ♀, under side, Tehachapi Mts., Cal., July 1, 1918 | 145 |
| Fig. 6. | *Basilarchia lorquini* ab. *comstocki* Gunder. ♂, under side, near Bishop, Cal., Aug. 28, 1921. Holotype | 144 |
| Fig. 7. | *B. lorquini* ab. *eavesii* Hy. Edw. ♂, Nevada Co., Cal., July 8. Courtesy Dr. William Barnes | 144 |



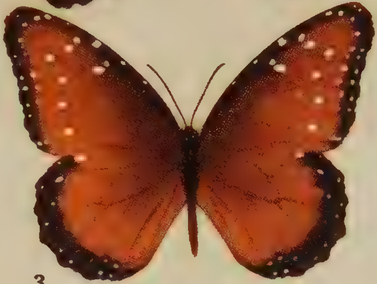
1

THE ARIZONA VICEROY
*Basilarchia obsoleta.* ♂



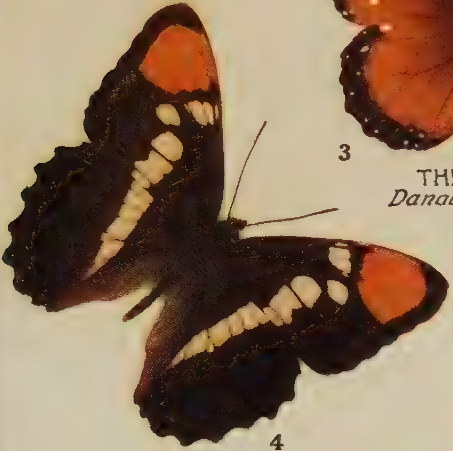
2

THE ARIZONA VICEROY
*Under side.* ♂



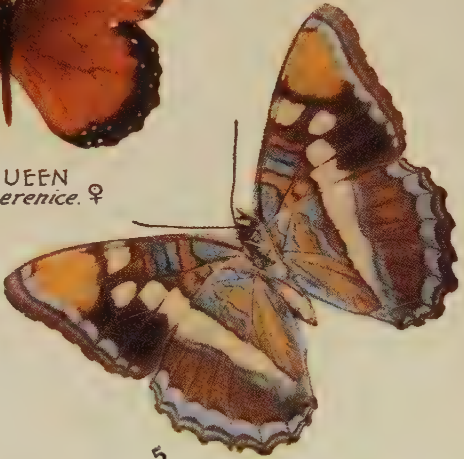
3

THE QUEEN
*Danaus berenice.* ♀



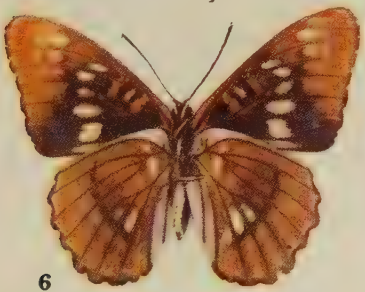
4

THE CALIFORNIA SISTER
*Heterochroa californica* ♂.



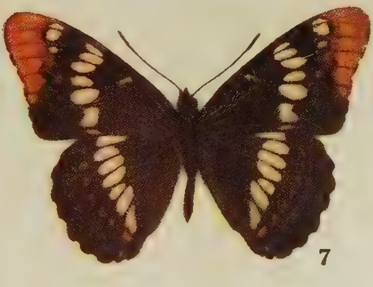
5

THE CALIFORNIA SISTER
*Under side.* ♀



6

COMSTOCK'S ABERRANT
ADMIRAL. *Under side.*



7

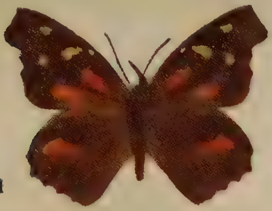
EAVES' ABERRANT
ADMIRAL *B. eavesii* ♂

All figures slightly reduced

Copyright 1927, John A. Comstock

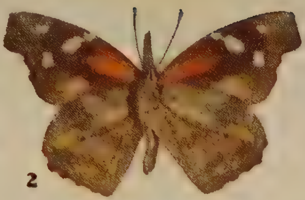
## EXPLANATION OF PLATE 47

| | | Text Page |
|---|---|---|
| Fig. 1. | *Libythea bachmanii* Kirt. ♂. Tucson, Ariz. Oct. 5, 1921. | 147 |
| Fig. 2. | *L. bachmanii* Kirt. ♂, under side. Tucson, Ariz. Oct. 8, 1921 | 147 |
| Fig. 3. | *L. bachmanii larvata* Stkr. ♂. Tucson, Ariz. Oct. 8, 1921 | 148 |
| Fig. 4. | *Apodemia mormo* F. & F. ♀. Eureka, Utah. Aug. 3, 1920 | 149 |
| Fig. 5. | *A. mormo* F. & F. ♀, under side. Palm Springs, Coachella Valley, Cal. April 10, 1921 | 149 |
| Fig. 6. | *A. mormo virgulti* Behr ♂. North Manhattan Beach, Cal. July 25, 1921 | 149 |
| Fig. 7. | *A. mormo virgulti* Behr ♀, under side. North Manhattan Beach, Cal. July 25, 1921 | 149 |
| Fig. 8. | *A. mormo deserti* B. & McD. ♂. Palm Springs, Riverside Co., Cal. April 23, 1922 | 151 |
| Fig. 9. | *A. palmerii marginalis* Skin. ♂. Indian Wells, Coachella Valley, Cal. Sept. 30, 1921 | 151 |
| Fig. 10. | *A. palmerii marginalis* Skin. ♂, under side. Indian Wells, Coachella Valley, Cal. Sept. 30, 1921 | 151 |
| Fig. 11. | *A. palmerii marginalis* Skin. ♀. Indian Wells, Coachella Valley, Cal. Sept. 30, 1921 | 151 |
| Fig. 12. | *A. mormo deserti* B. & McD. ♀. Palm Springs, Coachella Valley, Cal. April 23, 1922 | 151 |
| Fig. 13. | *A. mormo mejicanus* Behr ♀. Santa Cruz Co., Ariz. May, 1918 | 151 |
| Fig. 14. | *A. mormo mejicanus* Behr ♂, under side. Santa Cruz Co., Ariz. May, 1918 | 151 |
| Fig. 15. | *Calephelis australis* Edw. ♂, under side. Goldroad, Ariz. Sept., 1925 | 152 |
| Fig. 16. | *C. australis* Edw. ♂. Palm Springs, Cal. April 20, 1919 | 152 |
| Fig. 17. | *C. australis* Edw. ♀. Palm Springs, Cal. April 20, 1919 | 152 |
| Fig. 18. | *C. nemesis* Edw. ♂. Ray, Ariz. June 16, 1919 | 151 |
| Fig. 19. | *C. nemesis* Edw. ♀. So. Ariz. Sept. 24, 1910 | 151 |
| Fig. 20. | *Habrodais grunus* Bdv. ♂, under side. San Bernardino Mts., Cal. June | 154 |
| Fig. 21. | *Mitoura johnsoni* Skin. ♂, under side. Vancouver, B. C. May 27, 1905. Courtesy Dr. Wm. Barnes | 164 |
| Fig. 22. | *Habrodais grunus* Bdv. ♂. Copper Creek, Cal. July 28, 1914 | 154 |



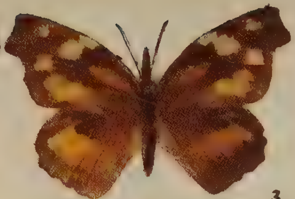
1

THE SNOUT BUTTERFLY
*Libythea bachmanii* ♂



2

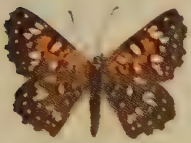
THE SNOUT
BUTTERFLY. *Under s.*



3

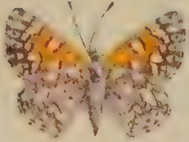
SOUTHERN SNOUT BUTTERFLY
*L. bachmanii larvata* ♂

## THE SNOUT BUTTERFLIES



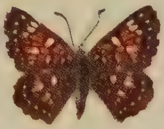
4

THE MORMON METAL-
MARK *Apodemia mormo.* ♀



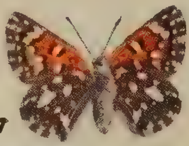
5

THE MORMON METAL-
MARK *Under side.* ♀



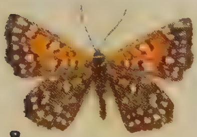
6

BEHR'S METAL-MARK
*A mormo virgulti* ♂



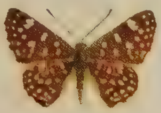
7

BEHR'S METAL-MARK
*Under side* ♀



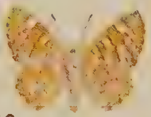
8

DESERT METAL-MARK
*A. mormo deserti* ♂



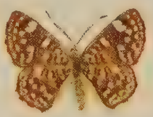
9

MARGINED
METAL-MARK
*A palmerii
marginalis* ♂



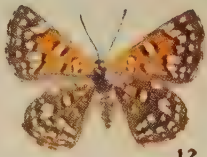
10

MARGINED
METAL-MARK
*Under side* ♂



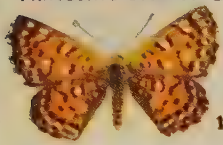
11

MARGINED
METAL-MARK
*A palmerii
marginalis* ♀



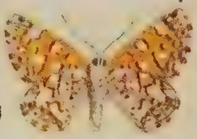
12

DESERT METAL-MARK
*A. mormo deserti* ♀



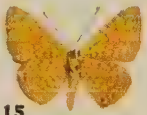
13

MEXICAN METAL-MARK
*A mormo mejicanus.* ♀



14

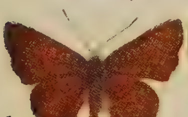
MEXICAN METAL-MARK
*Under side.*



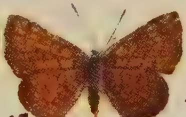
15

SOUTHERN METAL-
MARK. *Under side.* ♂

## THE METAL-MARKS

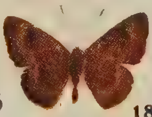


16

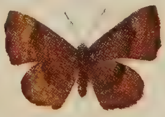


17

SOUTHERN METAL-MARK
♂ *Calephelis australis.* ♀

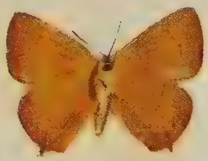


18



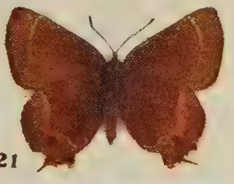
19

DUSKY METAL-MARK
♂ *Calephelis nemesis.* ♀



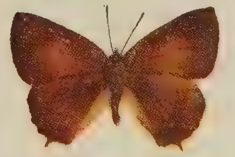
20

BOISDUVAL'S HAIR-STREAK
*Under side*



21

JOHNSON'S HAIR-
STREAK. *Under side.* ♂
*Mitoura johnsoni.*



22

BOISDUVAL'S HAIR-STREAK
*Habrodais grunus*

## THE HAIR-STREAKS

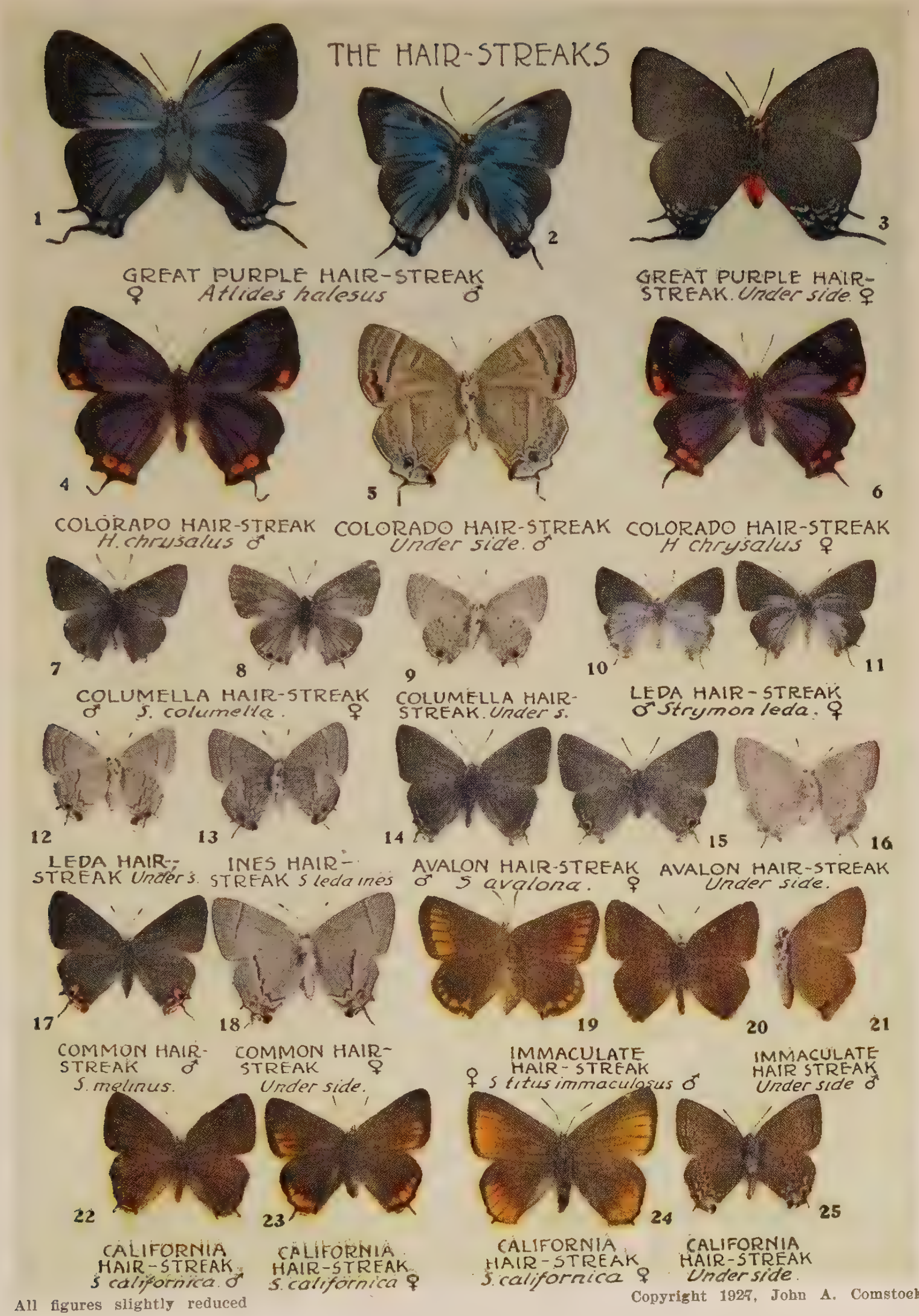
All figures slightly reduced

Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 48

| | | Text Page |
|---|---|---|
| Fig. 1. | *Atlides halesus* Cram. ♀, near Los Angeles, Cal. Oct. 10, 1923.. | 154 |
| Fig. 2. | *A. halesus* Cram. ♂, Coachise Co., Ariz. March 26, 1917.......... | 154 |
| Fig. 3. | *A. halesus* Cram. ♀, under side. Palm Springs, Coachella Valley, Cal. April 20, 1919.......... | 154 |
| Fig. 4. | *Hypaurotis chrysalus* Edw. ♂. Chiricahua Mts., Cochise Co., Ariz. July 20, 1916.......... | 156 |
| Fig. 5. | *H. chrysalus* Edw. ♂, under side. Jemez Springs, N. Mex. July 15, 1917 .......... | 156 |
| Fig. 6. | *H. chrysalus* Edw. ♀. Moab, Utah. July 17, 1920.......... | 156 |
| Fig. 7. | *Strymon columella* Fabr. ♂. El Centro, Cal. Oct. 4, 1924.......... | 156 |
| Fig. 8. | *S. columella* Fabr. ♀, Buckman Spgs., San Diego Co., Cal. Sept. 24, 1924 .......... | 156 |
| Fig. 9. | *S. columella* Fabr. ♀, under side. Brownsville, Tex. Courtesy Dr. Wm. Barnes .......... | 156 |
| Fig. 10. | *S. leda* Edw. ♂, Chiricahua Mts., Cochise Co., Ariz. June 23, 1916. | 156 |
| Fig. 11. | *S. leda* Edw. ♀, Browns Canyon, Baboquivaria Mts., Ariz. June 15, 1923 .......... | 156 |
| Fig. 12. | *S. leda* Edw. ♀, under side. Chiricahua Mts. Ariz. June 22, 1916.. | 156 |
| Fig. 13. | *S. leda ines* Edw. ♀, under side. Baboquivaria Mts. Ariz. Sept. 15 1923 .......... | 157 |
| Fig. 14. | *S. avalona* Wright. ♂. Catalina Island, Cal. Aug. 11, 1920........ | 157 |
| Fig. 15. | *S. avalona* Wright. ♀. Catalina Island, Cal. Aug. 4, 1920........ | 157 |
| Fig. 16. | *S. avalona* Wright. ♂, under side. Catalina Island, Cal. Aug. 14, 1918 .......... | 157 |
| Fig. 17. | *S. melinus* Hbn. ♂. Los Angeles, Cal. Sept. 10, 1918.......... | 157 |
| Fig. 18. | *S. melinus* Hbn. ♀, under side. Los Angeles, Cal. Sept. 15, 1921.. | 157 |
| Fig. 19. | *S. titus immaculosus* W. Comst. ♀. Provo, Utah. July 12, 1919. Compared with paratype. Courtesy Drs. Barnes & Benjamin.. | 159 |
| Fig. 20. | *S. titus immaculosus* W. Comst. ♂. Wallace, Idaho. July 14, 1918. | 159 |
| Fig. 21. | *S. titus immaculosus* W. Comst. ♂, under side. Provo, Utah. July 12, 1919. Compared with paratype. Courtesy Drs. Barnes & Benjamin .......... | 159 |
| Fig. 22. | *S. californica* Edw. ♂. Wawona near Yosemite, Cal. June 27, 1921 .......... | 159 |
| Fig. 23. | *S. californica* Edw. ♀. Mammoth Camp, Mono Co. Cal. July 22, 1922 .......... | 159 |
| Fig. 24. | *S. californica* Edw. ♀. Walker Canyon, near Bridgeport, Cal. Aug. 6, 1922 .......... | 159 |
| Fig. 25. | *S. californica* Edw. ♂, under side. Wawona near Yosemite, Cal. June 27, 1921.......... | 159 |

THE HAIR-STREAKS



GREAT PURPLE HAIR-STREAK ♀ *Atlides halesus* ♂

GREAT PURPLE HAIR-STREAK. *Under side.* ♀

COLORADO HAIR-STREAK *H. chrysalus* ♂

COLORADO HAIR-STREAK *Under side.* ♂

COLORADO HAIR-STREAK *H chrysalus* ♀

COLUMELLA HAIR-STREAK ♂ *S. columella.* ♀

COLUMELLA HAIR-STREAK. *Under s.*

LEDA HAIR-STREAK ♂ *Strymon leda.* ♀

LEDA HAIR-STREAK *Under s.*

INES HAIR-STREAK *S leda ines*

AVALON HAIR-STREAK ♂ *S avalona.* ♀

AVALON HAIR-STREAK *Under side.*

COMMON HAIR-STREAK ♂ *S. melinus.*

COMMON HAIR-STREAK ♀ *Under side.*

IMMACULATE HAIR-STREAK ♀ *S titus immaculosus* ♂

IMMACULATE HAIR STREAK *Under side* ♂

CALIFORNIA HAIR-STREAK *S californica.* ♂

CALIFORNIA HAIR-STREAK *S. californica* ♀

CALIFORNIA HAIR-STREAK *S. californica* ♀

CALIFORNIA HAIR-STREAK *Under side.*

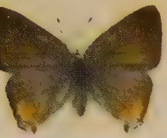
All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 49

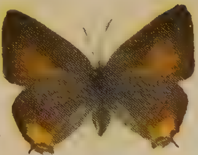
| | | Text Page |
|---|---|---|
| Fig. 1. | *Strymon sylvinus* Bdv. ♂, Griffith Park, Los Angeles, Cal. June 7, 1922 | 160 |
| Fig. 2. | *S. sylvinus* Bdv. ♀, Griffith Park, Los Angeles, Cal. June 23, 1922 | 160 |
| Fig. 3. | *S. sylvinus* Bdv. ♀, under side, Griffith Park, Los Angeles, Cal. June 23, 1922 | 160 |
| Fig. 4. | *S. sylvinus desertorum* Grin. ♂, (type) Oak Creek, Kern Co., Cal. June 29. Courtesy Jean Gunder | 160 |
| Fig. 5. | *S. sylvinus desertorum* Grin. ♀, (type) Oak Creek, Kern Co., Cal. June 29. Courtesy Jean Gunder | 160 |
| Fig. 6. | *S. dryope* Edw. ♂. No data. Courtesy J. E. Cottle | 160 |
| Fig. 7. | *S. dryope* Edw. ♂, under side. No data. Courtesy J. E. Cottle | 160 |
| Fig. 8. | *S. dryope* Edw. ♀, Tehachapi, Kern Co., Cal. No date. Courtesy Drs. Barnes & Benjamin | 160 |
| Fig. 9. | *S. auretorum spadix* Hy. Edw. ♂, Mt. Wilson, Cal. June 25, 1919 | 161 |
| Fig. 10. | *S. auretorum spadix* Hy. Edw. ♂, under side, San Bernardino Mts., So. Cal. June 28, 1919 | 161 |
| Fig. 11. | *S. auretorum spadix* Hy. Edw. ♀, Mt. Wilson, Cal. July 2, 1920 | 161 |
| Fig. 12. | *S. adenostomatis* Hy. Edw. ♂, San Diego, Cal. June 18, 1924 | 162 |
| Fig. 13. | *S. adenostomatis* Hy. Edw. ♀, San Diego, Cal. June 18, 1924 | 162 |
| Fig. 14. | *S. adenostomatis* Hy. Edw. ♂, under side, (a typical) Jacumba Hot Springs, San Diego Co., Cal. June 19, 1924 | 162 |
| Fig. 15. | *S. adenostomatis* Hy. Edw. ♂, under side, San Gabriel Mts., So. Cal. June 21, 1923 | 162 |
| Fig. 16. | *S. saepium* Bdv. ♂, Eagle Rock Park, Los Angeles, Cal. June 28, 1919 | 162 |
| Fig. 17. | *S. saepium* Bdv. ♀, San Diego Co., Cal. June 18, 1924 | 162 |
| Fig. 18. | *S. saepium* Bdv. ♂, Shasta Co., Cal. July 2, 1921 | 162 |
| Fig. 19. | *S. saepium fulverscens* Hy. Edw. ♀, Monache Meadows, Tulare Co., Cal. August 23, 1917 | 162 |
| Fig. 20. | *S. saepium fulvescens* Hy. Edw. ♂, under side, Monache Meadows, Tulare Co., Cal., August 17, 1917 | 162 |
| Fig. 21. | *S. saepium chlorophora* Wats. & W. P. Comst. ♂, San Diego, Cal. June 18, 1924 | 162 |
| Fig. 22. | *S. saepium chlorophora* Wats. & W. P. Comst. ♂, under side, San Diego, Cal. June 18, 1924 | 162 |
| Fig. 23. | *S. chalcis* Edw. ♂, under side, Middle, Cal. No date. Courtesy Drs. Barnes & Benjamin | 163 |
| Fig. 24. | *Mitoura spinetorum* Hew. ♀, Chiricahua Mts., So. Ariz. June 17, 1916 | 163 |
| Fig. 25. | *M. spinetorum* Hew. ♂, under side, Chiricahua Mts., So. Ariz. June 17, 1916 | 163 |
| Fig. 26. | *M. spinetorum cuyamaca* W. S. Wright ♂, under side, (Paratype No. 4), Sierra Madre Range, Los Angeles Co., Cal. July 5, 1920 | 163 |

# THE HAIR-STREAKS



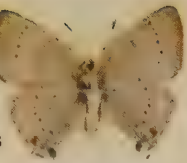
1

SYLVAN
HAIR-STREAK
*S. sylvinus* ♂



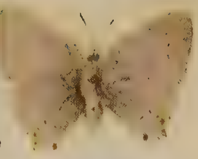
2

SYLVAN
HAIR-STREAK
*S. sylvinus* ♀



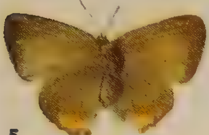
3

SYLVAN
HAIR-STREAK
*Under side*



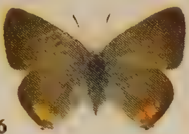
4

DESERT
HAIR-STREAK
*Under side.* ♂



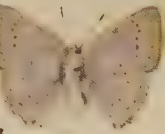
5

DESERT HAIR-
STREAK *S sylvinus
- desertorum.* ♀



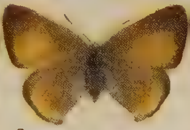
6

DRYOPE
HAIR-STREAK
*S. dryope.* ♂



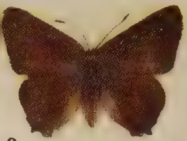
7

DRYOPE
HAIR-STREAK
*Under side*



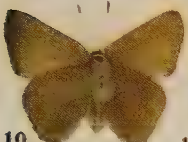
8

DRYOPE
HAIR-STREAK
*S. dryope.* ♀



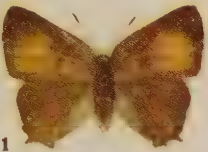
9

NUT-BROWN
HAIR-STREAK
*S. spadix* ♂



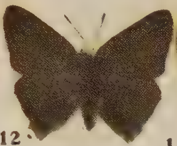
10

NUT-BROWN
HAIR-STREAK
*Under side.* ♂



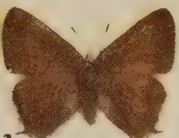
11

NUT-BROWN
HAIR-STREAK
*S. spadix* ♀



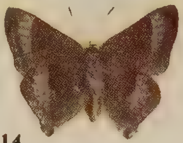
12

THE GREY HAIR-
STREAK. *Strymon
adenostomatis.* ♂



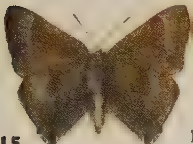
13

THE GREY HAIR-
STREAK. *Strymon
adenostomatis.* ♀



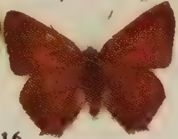
14

GREY
HAIR-STREAK
*Under side* ♂



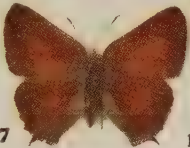
15

GREY
HAIR-STREAK
*Under side.* ♂



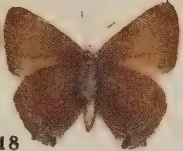
16

THE HEDGE-ROW
HAIR-STREAK. ♂
*Strymon saepium*



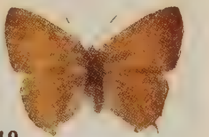
17

THE HEDGE-ROW
HAIR-STREAK
*Strymon saepium* ♀



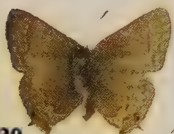
18

THE HEDGE-ROW
HAIR-STREAK
*Under side*



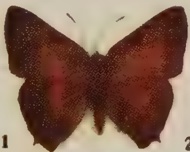
19

THE TAWNY HAIR-
STREAK. *Strymon
saepium fulvescens.*



20

TAWNY
HAIR-STREAK
*Under side*

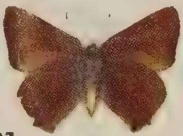


21

PURPLISH-BROWN
HAIR-STREAK.
*S. saepium chlorophora*

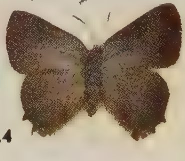
22

PURPLISH-BROWN
HAIR-STREAK
*Under side.* ♂



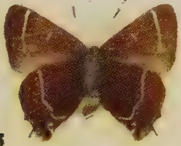
23

BRONZED HAIR-
STREAK. *S. chalcis
Under side.* ♂



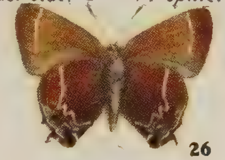
24

THICKET
HAIR-STREAK
*M. spinetorum* ♀



25

THICKET
HAIR-STREAK
*Under side.*



26

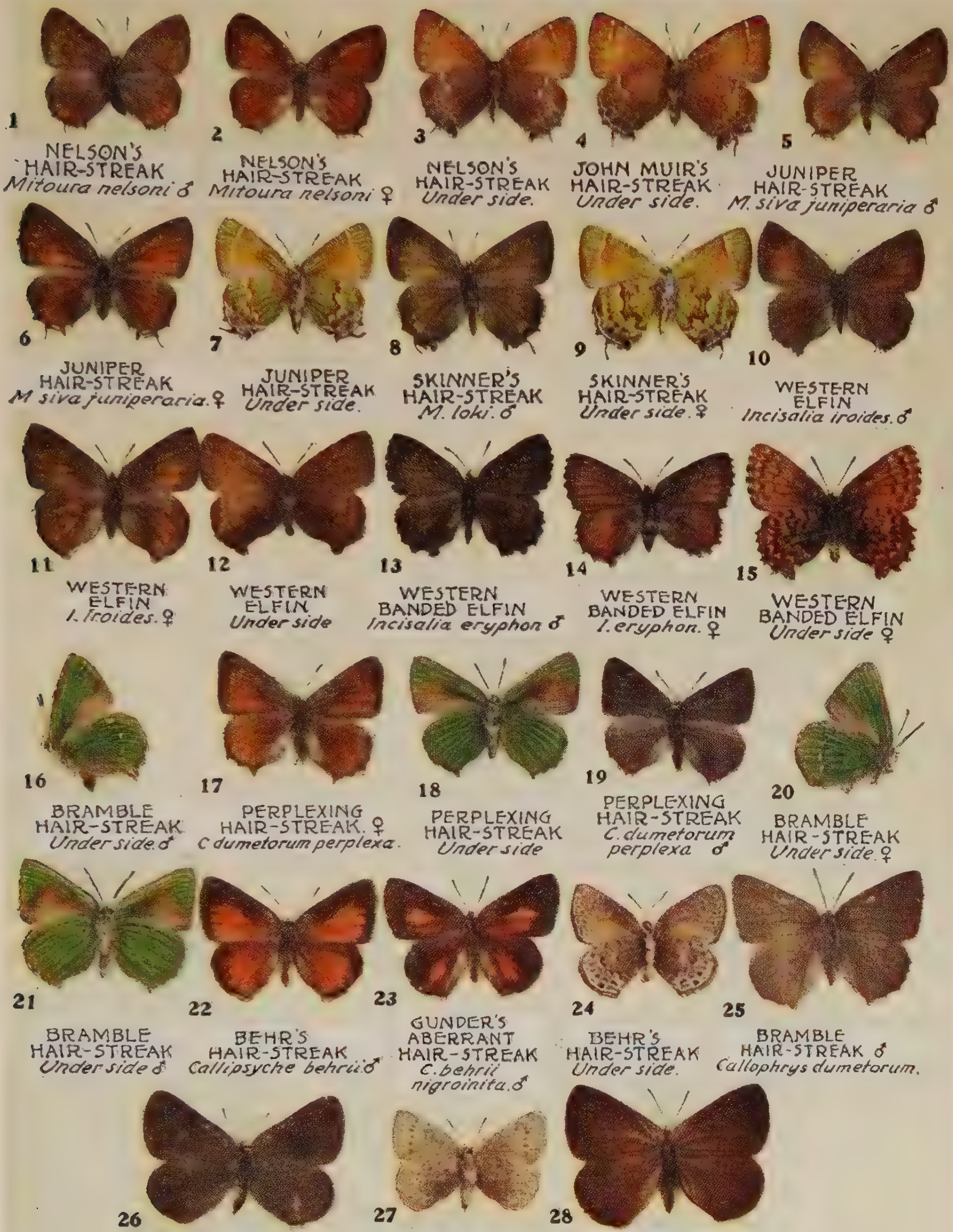
CUYAMACA
HAIR-STREAK
*Under side.*

All figures slightly reduced

Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 50

| | | Text Page |
|---|---|---|
| Fig. 1. | *Mitoura nelsoni* Bdv. ♂. Wawona, near Yosemite, Cal. June 26, 1921 | 164 |
| Fig. 2. | *M. nelsoni* Bdv. ♀. Santa Rosa Mts. Cal. June 27, 1908 | 164 |
| Fig. 3. | *M. nelsoni* Bdv. ♀, under side. Wawona, near Yosemite, Cal. June 27, 1921 | 164 |
| Fig. 4. | *M. nelsoni muiri* Hy. Edw. ♀, under side. Willow Ranch, Buck Creek, Modoc Co. Cal. June 5, 1924 | 164 |
| Fig. 5. | *M. siva juniperaria* Comst. ♂. Mint Canyon, L. A. Co. Cal. April 30, 1923. Holotype | 165 |
| Fig. 6. | *M. siva juniperaria* Comst. ♀. Mint Canyon, L. A. Co. Cal. April 30, 1923. Allotype | 165 |
| Fig. 7. | *M. siva juniperaria* Comst. ♀, under side. Mint Canyon, L. A. Co. Cal. April 16, 1923 | 165 |
| Fig. 8. | *M. loki* Skin. ♂. Near Jacumba Hot Spgs, San Diego Co., Cal. June 19, 1924 | 167 |
| Fig. 9. | *M. loki.* Skin. ♀, under side. Near Jacumba Hot Spgs, San Diego Co., Cal. June 19, 1924 | 167 |
| Fig. 10. | *Incisalia iroides* Bdv. ♂. Glacier Point, Yosemite, Cal. July 1, 1921 | 167 |
| Fig. 11. | *I. iroides* Bdv. ♀. Griffith Park, Los Angeles, Cal. April 10, 1921 | 167 |
| Fig. 12. | *I. iroides* Bdv. ♀, under side. Dunsmuir, Siskiyou Co., Cal. June 26, 1921 | 167 |
| Fig. 13. | *I. eryphon* Bdv. ♂. Glacier Point, Yosemite. Cal. July 2, 1921 | 167 |
| Fig. 14. | *I. eryphon* Bdv. ♀. Fitzgerald, B. C., Canada. July 1, 1920 | 167 |
| Fig. 15. | *I. eryphon* Bdv. ♀ under side. Mammoth Camp, Mono Co., Cal. July 16, 1922 | 167 |
| Fig. 16. | *Callophrys dumetorum* Bdv. ♂, under side. San Francisco, Cal. April 14, 1920 | 168 |
| Fig. 17. | *C. dumetorum perplexa* B. & Benj. ♀. Los Angeles Co., Cal. March 1, 1909 | 168 |
| Fig. 18. | *C. dumetorum perplexa* B. & Benj. ♀, under side. Los Angeles Co., Cal. March 1, 1909 | 168 |
| Fig. 19. | *C. dumetorum perplexa* B. & Benj. ♂. San Gabriel Canyon, L. A. Co., Cal. March 1, 1925 | 168 |
| Fig. 20. | *C. dumetorum* Bdv. ♀, under side. San Francisco, Cal. April 20, 1920 | 168 |
| Fig. 21. | *C. dumetorum* Bdv. ♂, under side. San Francisco, Cal. March 7, 1910 | 168 |
| Fig. 22. | *Callipsyche behrii* Edw. ♂. Truckee, Cal. July 23, 1909 | 169 |
| Fig. 23. | *C. behrii* ab. *nigroinita* Gunder. ♂. Mammoth Camp, Mono Co., Cal. Aug. 5, 1921. Holotype. Courtesy Jean Gunder | 169 |
| Fig. 24. | *C. behrii* Edw. ♂. Mammoth Camp, Mono Co., Cal. July 28, 1922 | 169 |
| Fig. 25. | *Callophrys dumetorum* Bdv. ♂, San Francisco, Cal. May 10, 1902. | 168 |
| Fig. 26. | *Satyrium fuliginosa* Edw. ♂. Trinity Co., Cal. Aug. 16, 1918 | 170 |
| Fig. 27. | *S. fuliginosa* Edw. ♂, under side. Ward's Peak, Placer Co., Cal. July 29, 1909 | 170 |
| Fig. 28. | *S. fuliginosa* Edw. ♀. Trinity Co., Cal. Aug. 16, 1918 | 170 |



1 NELSON'S HAIR-STREAK *Mitoura nelsoni* ♂

2 NELSON'S HAIR-STREAK *Mitoura nelsoni* ♀

3 NELSON'S HAIR-STREAK *Under side.*

4 JOHN MUIR'S HAIR-STREAK *Under side.*

5 JUNIPER HAIR-STREAK *M. siva juniperaria* ♂

6 JUNIPER HAIR-STREAK *M siva juniperaria.* ♀

7 JUNIPER HAIR-STREAK *Under side.*

8 SKINNER'S HAIR-STREAK *M. loki.* ♂

9 SKINNER'S HAIR-STREAK *Under side.* ♀

10 WESTERN ELFIN *Incisalia iroides.* ♂

11 WESTERN ELFIN *I. Iroides.* ♀

12 WESTERN ELFIN *Under side*

13 WESTERN BANDED ELFIN *Incisalia eryphon* ♂

14 WESTERN BANDED ELFIN *I. eryphon.* ♀

15 WESTERN BANDED ELFIN *Under side* ♀

16 BRAMBLE HAIR-STREAK *Under side.* ♂

17 PERPLEXING HAIR-STREAK. ♀ *C dumetorum perplexa.*

18 PERPLEXING HAIR-STREAK *Under side*

19 PERPLEXING HAIR-STREAK *C. dumetorum perplexa* ♂

20 BRAMBLE HAIR-STREAK *Under side.* ♀

21 BRAMBLE HAIR-STREAK *Under side* ♂

22 BEHR'S HAIR-STREAK *Callipsyche behrii.* ♂

23 GUNDER'S ABERRANT HAIR-STREAK *C. behrii nigroinita.* ♂

24 BEHR'S HAIR-STREAK *Under side.*

25 BRAMBLE HAIR-STREAK ♂ *Callophrys dumetorum.*

26 SOOTY GOSSAMER-WING *Satyrium fuliginosa.* ♂

27 SOOTY GOSSAMER-WING *Under side.*

28 SOOTY GOSSAMER-WING *S. fuliginosa.* ♀

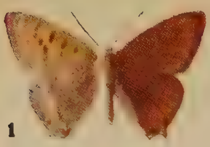
THE HAIR-STREAKS

All figures slightly reduced

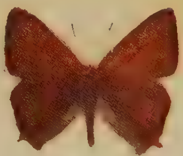
Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 51

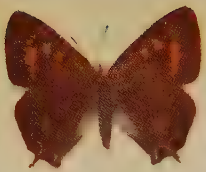
| | | Text Page |
|---|---|---|
| Fig. 1. | *Tharsalea arota* Bdv. ♂. Reproduced from Dr. Oberthur's figure of type. Left portion of figure, under side | 170 |
| Fig. 2. | *T. arota nubila* Comst. ♂. Griffith Park, Los Angeles, Cal. July 2, 1922. Holotype | 171 |
| Fig. 3. | *T. arota nubila* Comst. ♀. Griffith Park, Los Angeles, Cal. July 2, 1922. Allotype | 171 |
| Fig. 4. | *T. arota* Bdv. ♀. Reproduced from Dr. Oberthur's figure of type. Left portion of figure, under side | 170 |
| Fig. 5. | *T. arota nubila* Comst. ♂, under side. Griffith Park, Los Angeles, Cal. July 2, 1922 | 171 |
| Fig. 6. | *T. arota virginiensis* Edw. ♂. Virginia City, Nev. July 27, 1923 | 171 |
| Fig. 7. | *T. arota virginiensis* Edw. ♀. Virginia City, Nev. July 27, 1923 | 171 |
| Fig. 8. | *T. arota virginiensis* Edw. ♂, under side. Virginia City, Nev. July 27, 1923 | 171 |
| Fig. 9. | *T. hermes* Edw. ♀. San Diego, Cal. June 16, 1924 | 172 |
| Fig. 10. | *T. hermes* Edw. ♂, under side. San Diego, Cal. June 18, 1924 | 172 |
| Fig. 11. | *T. hermes* Edw. ♂. San Diego, Cal. June 18, 1924 | 172 |
| Fig. 12. | *Heodes gorgon* Bdv. ♂. Shasta Co. Cal. June 27, 1921 | 172 |
| Fig. 13. | *H. gorgon* Bdv. ♀. Shasta Co. Cal. June 27, 1921 | 172 |
| Fig. 14. | *H. gorgon* Bdv. ♂, under side, Ridge Route, Sierra Madre Mts., Cal. June 15, 1920 | 172 |
| Fig. 15. | *H. xanthoides* Bdv. ♀, under side. Oakland, Cal. June 13, 1916 | 172 |
| Fig. 16. | *H. xanthoides* Bdv. ♂. Griffith Park, Los Angeles, Cal. June 7, 1921 | 172 |
| Fig. 17. | *H. xanthoides* Bdv. ♀. Griffith Park, Los Angeles, Cal. June 5, 1921 | 172 |
| Fig. 18. | *H. xanthoides luctuosa* Watson & Comst. ♂. Tehachapi, Cal. June 2, 1918 | 173 |
| Fig. 19. | *H. xanthoides luctuosa* Watson & Comst. ♀, under side. Tehachapi, Cal. July 5, 1918 | 173 |
| Fig. 20. | *H. xanthoides luctuosa* Watson & Comst. ♀. Tehachapi, Cal. July 2, 1918 | 173 |



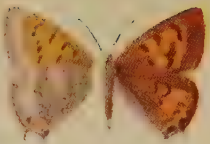
1 AROTA COPPER *Tharsalea arota* ♂



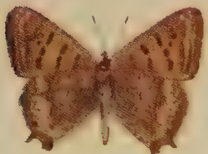
2 CLOUDY COPPER *T. arota nubila* ♂



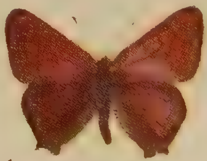
3 CLOUDY COPPER *T. arota nubila* ♀



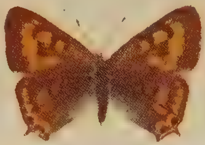
4 AROTA COPPER *T. arota* ♀



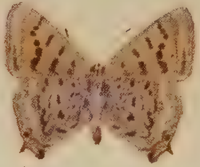
5 CLOUDY COPPER Under side ♂



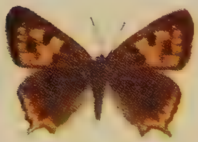
6 NEVADA COPPER *T. virginiensis* ♂



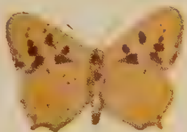
7 NEVADA COPPER *T. virginiensis* ♀



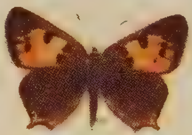
8 NEVADA COPPER Under side



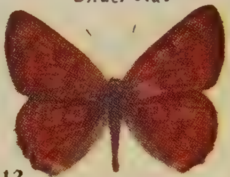
9 HERMES COPPER *T. hermes* ♀



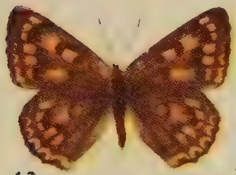
10 HERMES COPPER Under side ♂



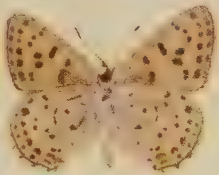
11 HERMES COPPER *T. hermes* ♂



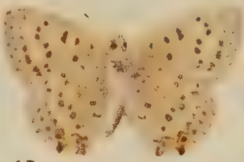
12 GORGON COPPER *Heodes gorgon* ♂



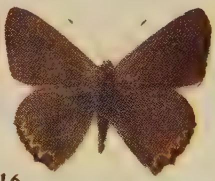
13 GORGON COPPER *H. gorgon* ♀



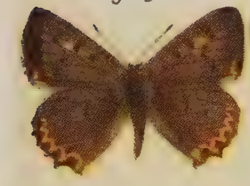
14 GORGON COPPER Under side ♂



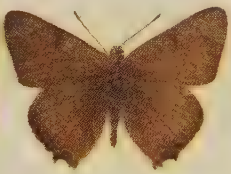
15 GREAT COPPER Under side ♀



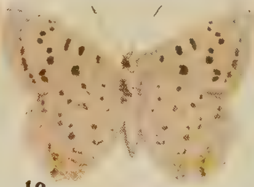
16 GREAT COPPER *H. xanthoides* ♂



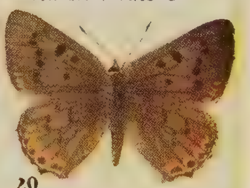
17 GREAT COPPER *H. xanthoides* ♀



18 MOURNING-GARBED COPPER *H. xanthoides luctuosa* ♂



19 MOURNING GARBED COPPER Under side ♀



20 MOURNING-GARBED COPPER *H. xanthoides luctuosa* ♀

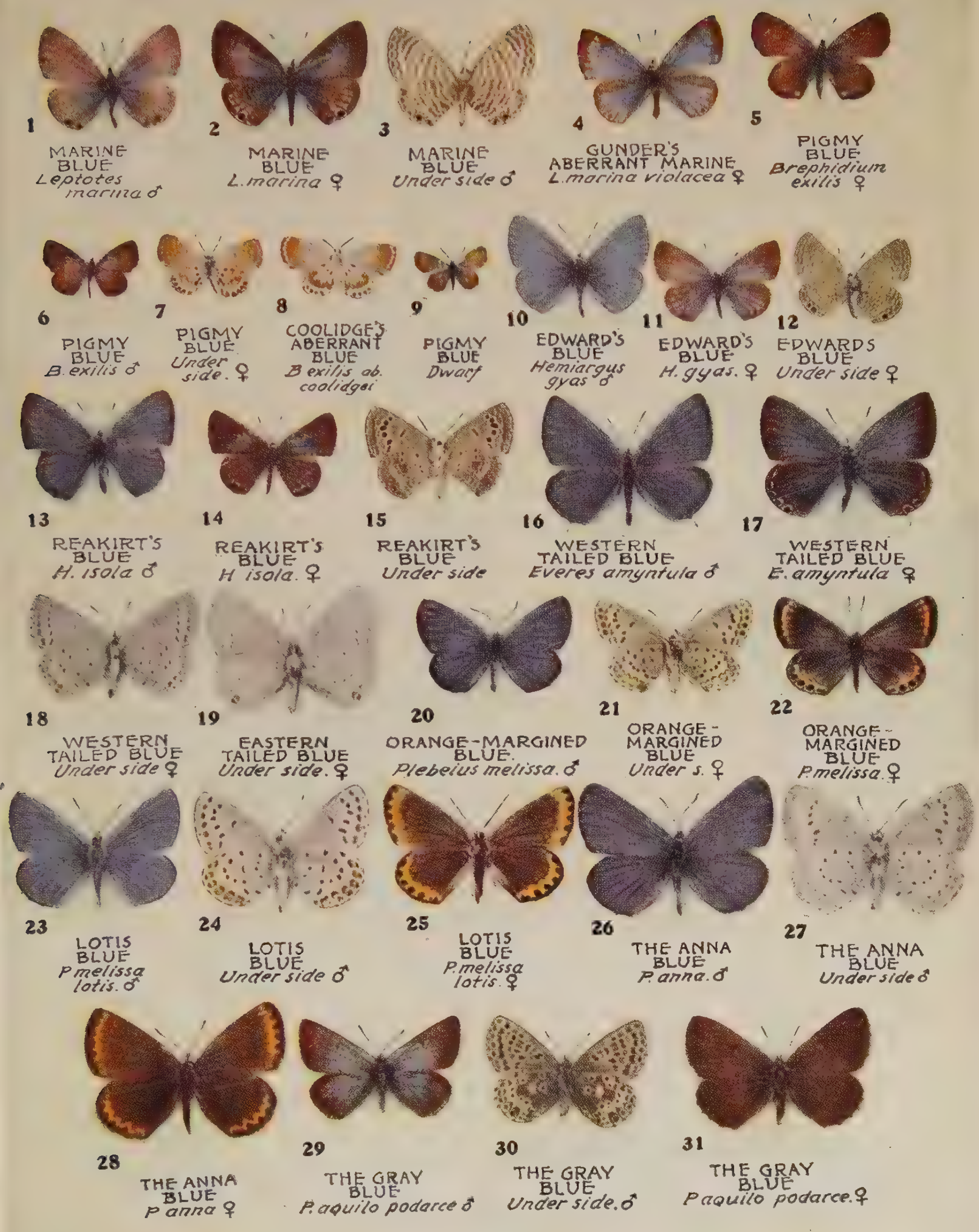
THE COPPERS

All figures slightly reduced

Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 53

| | | Text Page |
|---|---|---|
| Fig. 1. | *Leptotes marina* Reak. ♂. Ray, Arizona. June 2, 1918 | 177 |
| Fig. 2. | *L. marina* Reak. ♀. Near Idylwilde, San Jacinto Mts. Cal. June 10, 1925 | 177 |
| Fig. 3. | *L. marina* Reak., under side, ♂. Near Idylwilde, San Jacinto Mts. Cal. June 10, 1925 | 177 |
| Fig. 4. | *L. marina* ab. *violacea* Gunder, ♀. Oak Glen, Riverside Co. Cal. July 19, 1924. Type. Courtesy Jean Gunder | 178 |
| Fig. 5. | *Brephidium exilis* Bdv. ♀. Brawley, Cal. Aug. 3, 1923 | 178 |
| Fig. 6. | *B. exilis* Bdv. ♂. Palm Springs, Coachella Valley, Cal. April 20, 1919 | 178 |
| Fig. 7. | *B. exilis* Bdv. ♀, under side. Palm Springs, Coachella Valley, Cal. April 20, 1919 | 178 |
| Fig. 8. | *B. exilis* ab. *coolidgei* Gunder, ♀, under side. Los Angeles, Cal. July 12, 1922. Courtesy Jean Gunder. Type | 181 |
| Fig. 9. | *B. exilis* Bdv. dwarf, ♂. Venice, Cal. July 30, 1920 | 178 |
| Fig. 10. | *Hemiargus gyas* Edw. ♂. Indian Wells, Coachella Valley, Cal. Sept. 30, 1921 | 181 |
| Fig. 11. | *H. gyas* Edw. ♂. Indian Wells, Coachella Valley, Cal. Oct. 25, 1920 | 181 |
| Fig. 12. | *H. gyas* Edw. ♀, under side. Fertilla, Cal. Sept. 11, 1921 | 181 |
| Fig. 13. | *H. isola* Reak. ♂. Chiricahua Mts., Cochise Co., Ariz. May 19, 1908 | 181 |
| Fig. 14. | *H. isola* Reak. ♀. Mammoth Camp, Mono Co., Cal. July 22, 1922 | 181 |
| Fig. 15. | *H. isola* Reak. ♀, under side. Huachuca Mts., Ariz. May 26, 1910 | 181 |
| Fig. 16. | *Everes amyntula* Bdv. ♂, San Gabriel Mts., Cal. May 27, 1925 | 182 |
| Fig. 17. | *E. amyntula* Bdv. ♀, San Gabriel Mts., Cal. May 27, 1925 | 182 |
| Fig. 18. | *E. amyntula* Bdv. ♀, under side. San Gabriel Mts., Cal. May 27, 1925 | 182 |
| Fig. 19. | *E. comyntas* Godt. ♀, under side. Shasta Co., Cal. July 5, 1921 | 181 |
| Fig. 20. | *Plebejus melissa* Edw. ♂. Flagstaff, Ariz. July 27, 1916 | 183 |
| Fig. 21. | *P. melissa* Edw. ♀, under side. Mammoth Camp, Mono Co., Cal. July 22, 1922 | 183 |
| Fig. 22. | *P. melissa* Edw. ♀. Mammoth Camp, Mono Co., Cal. July 28, 1922. | 183 |
| Fig. 23. | *P. melissa lotis* Lint. ♂. Bouquet Canyon, Los Angeles Co. Cal. June 3, 1923 | 183 |
| Fig. 24. | *P. melissa lotis* Lint. ♂, under side. Bouquet Canyon, L. A. Co. Cal. June 3, 1923 | 183 |
| Fig. 25. | *P. melissa lotis* Lint. ♀. Bouquet Canyon, L. A. Co., Cal. June 3, 1923 | 183 |
| Fig. 26. | *P. anna* Edw. ♂. Shasta Co. Cal. July 9, 1921 | 183 |
| Fig. 27. | *P. anna* Edw. ♂, under side. Shasta Co. Cal. July 9, 1921 | 183 |
| Fig. 28. | *P. anna* Edw. ♀. Shasta Co. Cal. June 27, 1921 | 183 |
| Fig. 29. | *P. aquilo podarce* F. & F. ♂. Tioga Pass, above Yosemite Valley, Cal. Aug. 3, 1922 | 184 |
| Fig. 30. | *P. aquilo podarce* F. & F. ♂, under side. Tioga Pass, Cal. Aug. 4, 1922 | 184 |
| Fig. 31. | *P. aquilo podarce* F. & F. ♀. Tioga Pass, above Yosemite Valley, Cal. Aug. 4, 1922 | 184 |



1 MARINE BLUE *Leptotes marina* ♂

2 MARINE BLUE *L. marina* ♀

3 MARINE BLUE *Under side* ♂

4 GUNDER'S ABERRANT MARINE *L. marina violacea* ♀

5 PIGMY BLUE *Brephidium exilis* ♀

6 PIGMY BLUE *B. exilis* ♂

7 PIGMY BLUE *Under side.* ♀

8 COOLIDGE'S ABERRANT BLUE *B. exilis ab. coolidgei*

9 PIGMY BLUE *Dwarf*

10 EDWARD'S BLUE *Hemiargus gyas* ♂

11 EDWARD'S BLUE *H. gyas.* ♀

12 EDWARDS BLUE *Under side* ♀

13 REAKIRT'S BLUE *H. isola* ♂

14 REAKIRT'S BLUE *H. isola.* ♀

15 REAKIRT'S BLUE *Under side*

16 WESTERN TAILED BLUE *Everes amyntula* ♂

17 WESTERN TAILED BLUE *E. amyntula* ♀

18 WESTERN TAILED BLUE *Under side* ♀

19 EASTERN TAILED BLUE *Under side.* ♀

20 ORANGE-MARGINED BLUE. *Plebeius melissa.* ♂

21 ORANGE-MARGINED BLUE *Under s.* ♀

22 ORANGE-MARGINED BLUE *P. melissa.* ♀

23 LOTIS BLUE *P. melissa lotis.* ♂

24 LOTIS BLUE *Under side* ♂

25 LOTIS BLUE *P. melissa lotis.* ♀

26 THE ANNA BLUE *P. anna.* ♂

27 THE ANNA BLUE *Under side* ♂

28 THE ANNA BLUE *P. anna* ♀

29 THE GRAY BLUE *P. aquilo podarce* ♂

30 THE GRAY BLUE *Under side.* ♂

31 THE GRAY BLUE *P. aquilo podarce.* ♀

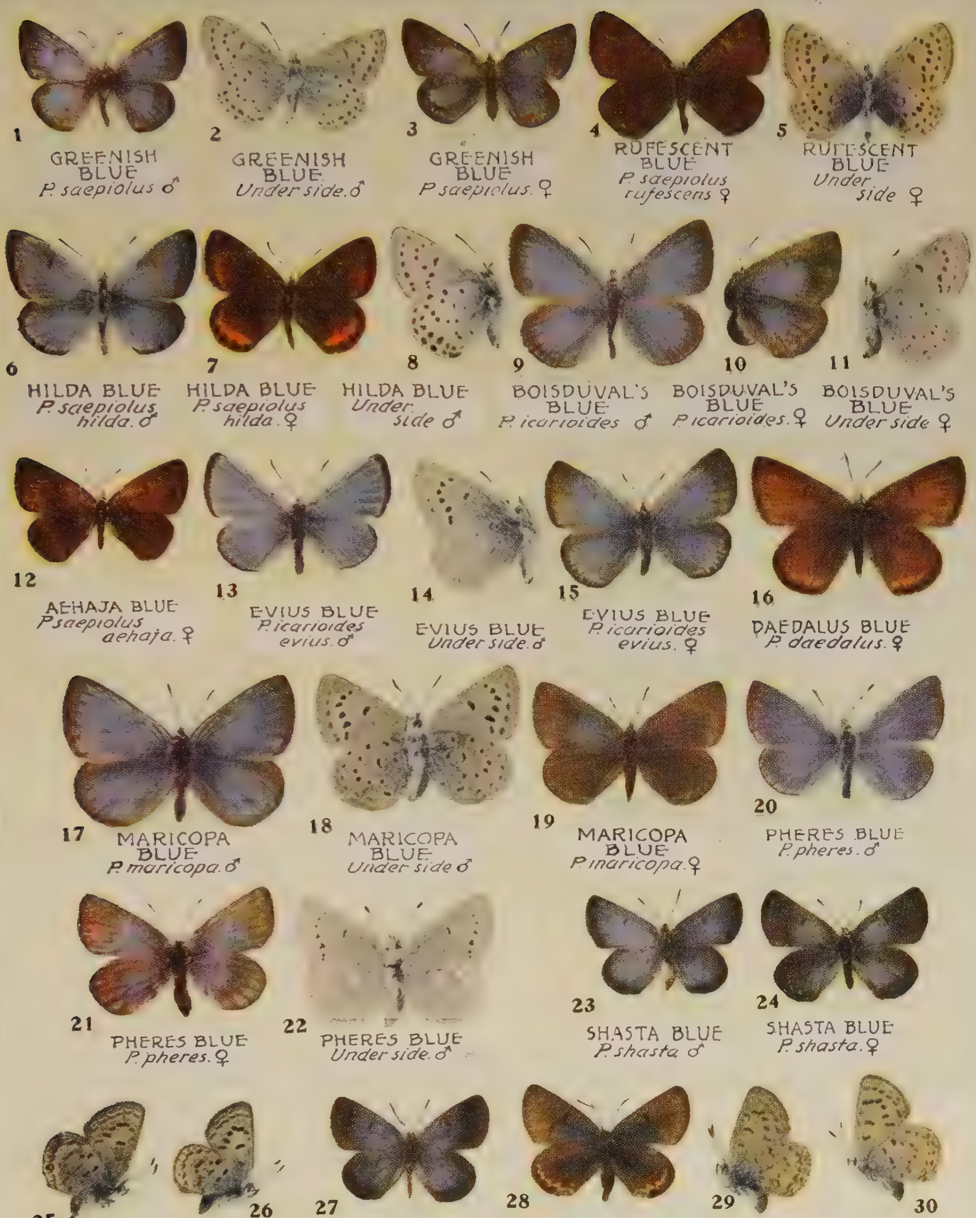
THE BLUES

All figures slightly reduced

Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 54

| | | Text Page |
|---|---|---|
| Fig. 1. | *Plebejus saepiolus* Bdv. ♂, Tuolumne Meadows, Tuolumne Co., Cal. July 8 | 184 |
| Fig. 2. | *P. saepiolus* Bdv. ♂, under side, Tuolumne Meadows, Tuolumne Co., Cal. July 1 | 184 |
| Fig. 3. | *P. saepiolus* Bdv. ♀, Cedar Mts., Iron Co., Utah. July 17, 1918 | 184 |
| Fig. 4. | *P. saepiolus rufescens* Bdv. ♀, Tioga Pass above Yosemite Valley, Cal. August 4, 1922 | 184 |
| Fig. 5. | *P. saepiolus rufescens* Bdv. ♀, under side, Tioga Pass above Yosemite, August 3, 1922. | 184 |
| Fig. 6. | *P. saepiolus hilda* Grin. ♂, Idylwilde, San Jacinto Mts., Cal. June 10, 1925 | 185 |
| Fig. 7. | *P. saepiolus hilda* Grin. ♀, Idylwilde, San Jacinto Mts., Cal. June 10, 1925 | 185 |
| Fig. 8. | *P. saepiolus hilda* Grin. ♂, under side, Idylwilde, San Jacinto Mts., Cal. June 10, 1925 | 185 |
| Fig. 9. | *P. icarioides* Bdv. ♂, Wawona near Yosemite, Cal. June 25, 1921 | 185 |
| Fig. 10. | *P. icarioides* Bdv. ♀, Wawona near Yosemite, Cal. June 25, 1921 | 185 |
| Fig. 11. | *P. icarioides* Bdv. ♀, under side, Glacier Point, Yosemite, Cal. June 29, 1921 | 185 |
| Fig. 12. | *P. saepiolus aehaja* Behr ♀, Glacier Point, Yosemite, Cal. June 29, 1921 | 185 |
| Fig. 13. | *P. icarioides evius* Bdv. ♂, Swartout Valley, San Gabriel Mts., Cal. May 27, 1925 | 186 |
| Fig. 14. | *P. icarioides evius* Bdv. ♀, under side, Swartout Valley, San Gabriel Mts., Cal. May 27, 1925 | 186 |
| Fig. 15. | *P. icarioides evius* Bdv. ♀, Swartout Valley, San Gabriel Mts., Cal. May 27, 1925 | 186 |
| Fig. 16. | *P. icarioides* ab. *daedalus* Behr ♀, Davis Creek, Modoc Co., Cal. July 11, 1922. Courtesy Jean Gunder | 186 |
| Fig. 17. | *P. maricopa* Reak. ♂, Tehachapi Mts., Cal. July 9, 1918 | 186 |
| Fig. 18. | *P. maricopa* Reak. ♂, under side, Tehachapi Mts., Cal. July 9, '18. | 186 |
| Fig. 19. | *P. maricopa* Reak. ♀, Marin Co., Cal. May 19, 1904 | 186 |
| Fig. 20. | *P. pheres* Bdv. ♂, Lake Merced, San Francisco Co., Cal. No data. | 186 |
| Fig. 21. | *P. pheres* Bdv. ♀, Parkside, San Francisco, Cal. June 4, 1920 | 186 |
| Fig. 22. | *P. pheres* Bdv. ♂, under side, Parkside, San Francisco, Cal. April 23, 1916 | 186 |
| Fig. 23. | *P. shasta* Edw. ♂, Glacier Point, Yosemite Park, Cal. Aug. 11, '21. | 187 |
| Fig. 24. | *P. shasta* Edw. ♀, Glacier Point, Yosemite Park, Cal. Aug. 11, '21. | 187 |
| Fig. 25. | *P. shasta* Edw. ♂, under side, Glacier Point, Yosemite Park, Cal. August 11, 1921 | 187 |
| Fig. 26. | *P. shasta* Edw. ♀, under side, Glacier Point, Yosemite Park, Cal. Aug. 11, 1921 | 187 |
| Fig. 27. | *P. shasta comstocki* C. L. Fox. ♂, (type) Glacier Point, Yosemite, Cal. July 11, 1922. Courtesy Jean Gunder | 187 |
| Fig. 28. | *P. shasta comstocki* C. L. Fox. ♀, (type) Glacier Point, Yosemite, Cal. July 11, 1922. Courtesy Jean Gunder | 187 |
| Fig. 29. | *P. shasta comstocki* C. L. Fox. ♂, under side, Glacier Point, Yosemite Park, Cal. July 11, 1922. Courtesy Jean Gunder | 187 |
| Fig. 30. | *P. shasta comstocki* C. L. Fox. ♀, under side, Glacier Point, Yosemite Park, Cal. July 11, 1922. Courtesy Jean Gunder | 187 |



1 GREENISH BLUE *P. saepiolus* ♂

2 GREENISH BLUE *Under side.* ♂

3 GREENISH BLUE *P. saepiolus.* ♀

4 RUFESCENT BLUE *P. saepiolus rufescens* ♀

5 RUFESCENT BLUE *Under side* ♀

6 HILDA BLUE *P. saepiolus hilda.* ♂

7 HILDA BLUE *P. saepiolus hilda.* ♀

8 HILDA BLUE *Under side* ♂

9 BOISDUVAL'S BLUE *P. icarioides* ♂

10 BOISDUVAL'S BLUE *P. icarioides.* ♀

11 BOISDUVAL'S BLUE *Under side* ♀

12 AEHAJA BLUE *P. saepiolus aehaja.* ♀

13 EVIUS BLUE *P. icarioides evius.* ♂

14 EVIUS BLUE *Under side.* ♂

15 EVIUS BLUE *P. icarioides evius.* ♀

16 DAEDALUS BLUE *P. daedalus.* ♀

17 MARICOPA BLUE *P. maricopa.* ♂

18 MARICOPA BLUE *Under side* ♂

19 MARICOPA BLUE *P. maricopa.* ♀

20 PHERES BLUE *P. pheres.* ♂

21 PHERES BLUE *P. pheres.* ♀

22 PHERES BLUE *Under side.* ♂

23 SHASTA BLUE *P. shasta* ♂

24 SHASTA BLUE *P. shasta.* ♀

25 26 SHASTA BLUE ♂ *Under side.* ♀

27 YOSEMITE BLUE *P. shasta comstocki* ♂

28 YOSEMITE BLUE *P. shasta comstocki* ♀

29 30 YOSEMITE BLUE ♂ *Under side.* ♀

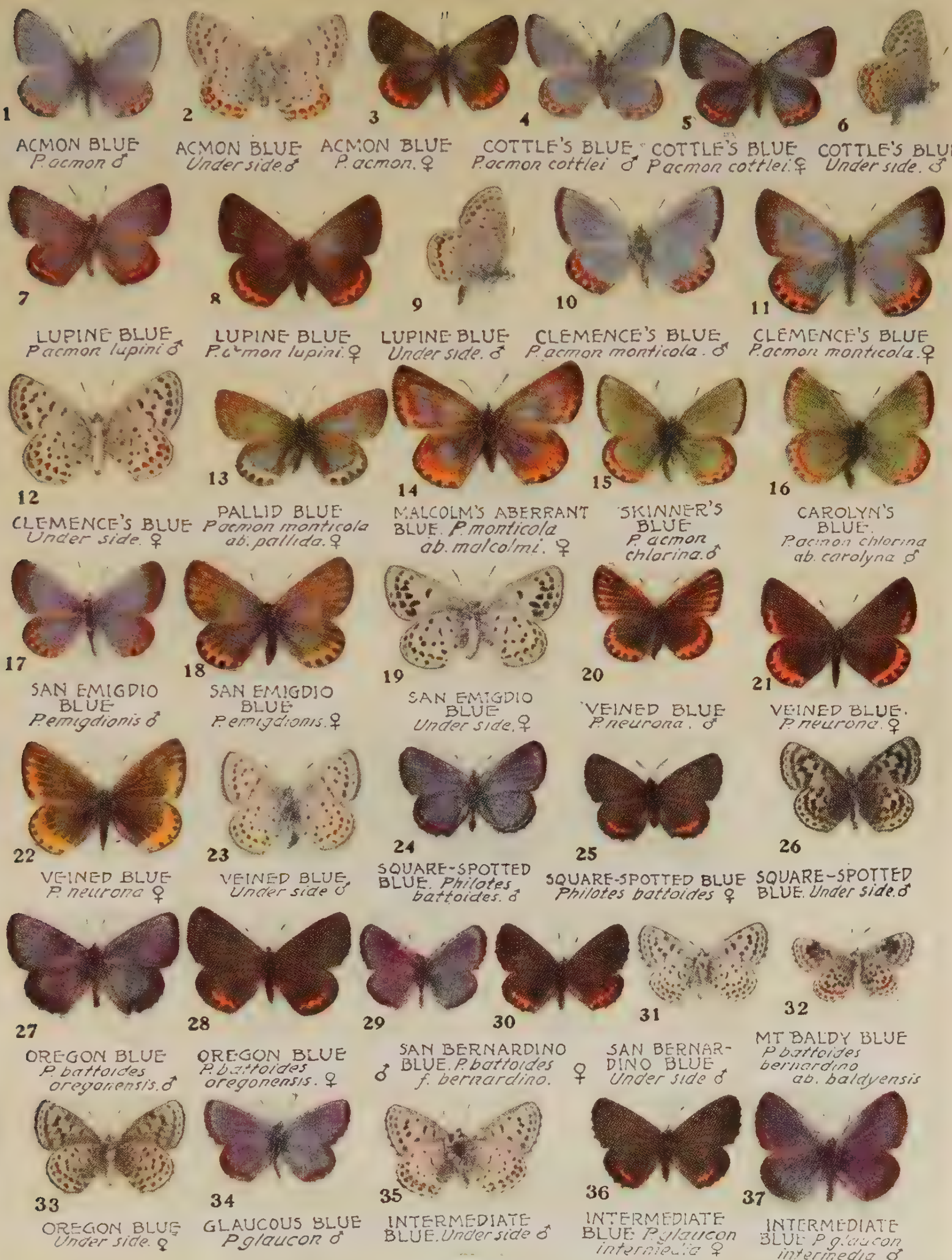
THE BLUES

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 55

| | | Text Page |
|---|---|---|
| Fig. 1. | *Plebejus acmon* West. & Hew. ♂, Los Angeles, Cal., June 10, 1918. | 188 |
| Fig. 2. | *P. acmon* West. & Hew. ♂, under side, Arroyo Seco, Los Angeles, Cal., May 5, 1910 | 188 |
| Fig. 3. | *P. acmon* West. & Hew. ♀, San Jacinto Mts., Cal., May 21, 1908 | 188 |
| Fig. 4. | *P. acmon cottlei* Grin. ♂, Glendale, Cal., May 15, 1925 | 188 |
| Fig. 5. | *P. acmon cottlei* Grin. ♀, Glendale, Cal., May 15, 1925 | 188 |
| Fig. 6. | *P. acmon cottlei* Grin. ♂, under side, Fish Canyon, Monrovia, Cal., Feb. 10, 1925 | 188 |
| Fig. 7. | *P. acmon lupini* Bdv. ♂, Glacier Point, Yosemite, Cal., July 8, '22. | 189 |
| Fig. 8. | *P. acmon lupini* Bdv. ♀, Glacier Point, Yosemite, Cal. June 29, '21. | 189 |
| Fig. 9. | *P. acmon lupini* Bdv. ♂, under side, Glacier Point above Yosemite, Cal., July 8, 1922 | 189 |
| Fig. 10. | *P. acmon monticola* Clemence. ♂, (type), Upper Arroyo Seco, L. A. Co., Cal., June 12, 1907 | 189 |
| Fig. 11. | *P. acmon monticola* Clemence. ♀, (type), Upper Arroyo Seco, L. A. Co., Cal., June 8, 1907 | 189 |
| Fig. 12. | *P. acmon monticola* Clemence. ♀, (from type series), Upper Arroyo Seco, Cal., June 8, 1907 | 189 |
| Fig. 13. | *P. acmon monticola* ab. *pallida* Gunder. ♀, Cajon Pass, San Bernardino Co., Cal., May 14, 1922. Courtesy Jean Gunder | 189 |
| Fig. 14. | *P. acmon monticola* ab. *malcolmi* Gunder. ♀, (type), Ridge Route, L. A. Co., Cal., May 30, 1922. Courtesy Jean Gunder | 189 |
| Fig. 15. | *P. acmon chlorina* Skin. ♂, Tehachapi, Cal., July 7, 1918 | 190 |
| Fig. 16. | *P. acmon chlorina* ab. *carolyna* Comst. ♂, (type), Tehachapi, Cal., July 1, 1921 | 190 |
| Fig. 17. | *P. emigdionis* Grin. ♂, Mojave Desert near Victorville, Cal., May 28, 1922 | 191 |
| Fig. 18. | *P. emigdionis* Grin. ♀, Mojave Desert near Victorville, Cal., May 28, 1922 | 191 |
| Fig. 19. | *P. emigdionis* Grin. ♀, under side, Mint Canyon Road, L. A. Co., Cal., May 1, 1921 | 191 |
| Fig. 20. | *P. neurona* Skin. ♂, Tehachapi, Cal., July 8, 1918 | 190 |
| Fig. 21. | *P. neurona* Skin. ♀, not typical. Tehachapi Mts., Cal., July, 1918. | 190 |
| Fig. 22. | *P. neurona* Skin. ♀, Tehachapi Mts., Cal., July 1, 1918 | 190 |
| Fig. 23. | *P. neurona* Skin. ♂, under side, Tehachapi Mts., Cal., July 9, '18. | 190 |
| Fig. 24. | *Philotes battoides* Behr ♂, Mammoth Camp, Mono Co., Cal., July 23, 1922 | 191 |
| Fig. 25. | *P. battoides* Behr ♀, Mineral King, Tulare Co., Cal., July 8, 1915. | 191 |
| Fig. 26. | *P. battoides* Behr ♂, under side, Mammoth Camp, Mono Co., Cal., July 23, 1922 | 191 |
| Fig. 27. | *P. battoides oregonensis* B. & McD. ♂, Crater Lake, Ore., July 24. (Comp. with type). Courtesy Dr. Wm. Barnes | 191 |
| Fig. 28. | *P. battoides oregonensis* B. & McD. ♀, Crater Lake, Ore., Aug. 2, 1923 | 191 |
| Fig. 29. | *P. battoides bernardino* B. & McD. ♂, Sierra Madre Mts., Cal., July 6. 1920 | 192 |
| Fig. 30. | *P. battoides bernardino* B. & McD. ♀, Sierra Madre Mts., Cal., July 6, 1920 | 192 |
| Fig. 31. | *P. battoides bernardino* B. & McD. ♂, under side, Ridge Route, Sierra Madre Mts., Cal., June 21, 1923 | 192 |
| Fig. 32. | *P. battoides bernardino* ab. *baldyensis* Gunder. ♀, (type), under side, Camp Baldy, San Bernardino Co., Cal., July 5, 1924. Courtesy Jean Gunder | 192 |
| Fig. 33 | *P. battoides oregonensis* B. & McD. ♀, under side, (paratype) Crater Lake, Ore., July 24. Courtesy Drs. Barnes and Benjamin | 191 |
| Fig. 34. | *P. glaucon* Edw. ♂, Reno, Nev., no date | 192 |
| Fig. 35. | *P. glaucon intermedia* B. & McD. ♂, under side, (paratype), Shasta Co., Cal., July 10. This insect was used in B. & McD. Contributions Vol. III No. 4, Pl. 16, fig. 5. Courtesy Dr. Wm. Barnes | 193 |
| Fig. 36. | *P. glaucon intermedia* B. & McD. ♀, Shasta Co., Cal., July 2, '21. | 193 |
| Fig. 37. | *P. glaucon intermedia* B. & McD. ♂, Shasta Co., Cal., July 2, '21. | 193 |



1 ACMON BLUE *P. acmon* ♂

2 ACMON BLUE *Under side.* ♂

3 ACMON BLUE *P. acmon.* ♀

4 COTTLE'S BLUE *P. acmon cottlei* ♂

5 COTTLE'S BLUE *P. acmon cottlei.* ♀

6 COTTLE'S BLUE *Under side.* ♂

7 LUPINE BLUE *P. acmon lupini* ♂

8 LUPINE BLUE *P. acmon lupini.* ♀

9 LUPINE BLUE *Under side.* ♂

10 CLEMENCE'S BLUE *P. acmon monticola.* ♂

11 CLEMENCE'S BLUE *P. acmon monticola.* ♀

12 CLEMENCE'S BLUE *Under side.* ♀

13 PALLID BLUE *P. acmon monticola ab. pallida.* ♀

14 MALCOLM'S ABERRANT BLUE. *P. monticola ab. malcolmi.* ♀

15 SKINNER'S BLUE *P. acmon chlorina.* ♂

16 CAROLYN'S BLUE. *P. acmon chlorina ab. carolyna* ♂

17 SAN EMIGDIO BLUE *P. emigdionis* ♂

18 SAN EMIGDIO BLUE *P. emigdionis.* ♀

19 SAN EMIGDIO BLUE *Under side.* ♀

20 VEINED BLUE *P. neurona.* ♂

21 VEINED BLUE. *P. neurona.* ♀

22 VEINED BLUE *P. neurona* ♀

23 VEINED BLUE *Under side* ♂

24 SQUARE-SPOTTED BLUE. *Philotes battoides.* ♂

25 SQUARE-SPOTTED BLUE *Philotes battoides* ♀

26 SQUARE-SPOTTED BLUE. *Under side.* ♂

27 OREGON BLUE *P. battoides oregonensis.* ♂

28 OREGON BLUE *P. battoides oregonensis.* ♀

29 ♂ 30 ♀ SAN BERNARDINO BLUE. *P. battoides f. bernardino.*

31 SAN BERNARDINO BLUE *Under side* ♂

32 MT BALDY BLUE *P. battoides bernardino ab. baldyensis*

33 OREGON BLUE *Under side.* ♀

34 GLAUCOUS BLUE *P. glaucon* ♂

35 INTERMEDIATE BLUE. *Under side* ♂

36 INTERMEDIATE BLUE *P. glaucon intermedia* ♀

37 INTERMEDIATE BLUE *P. glaucon intermedia* ♂

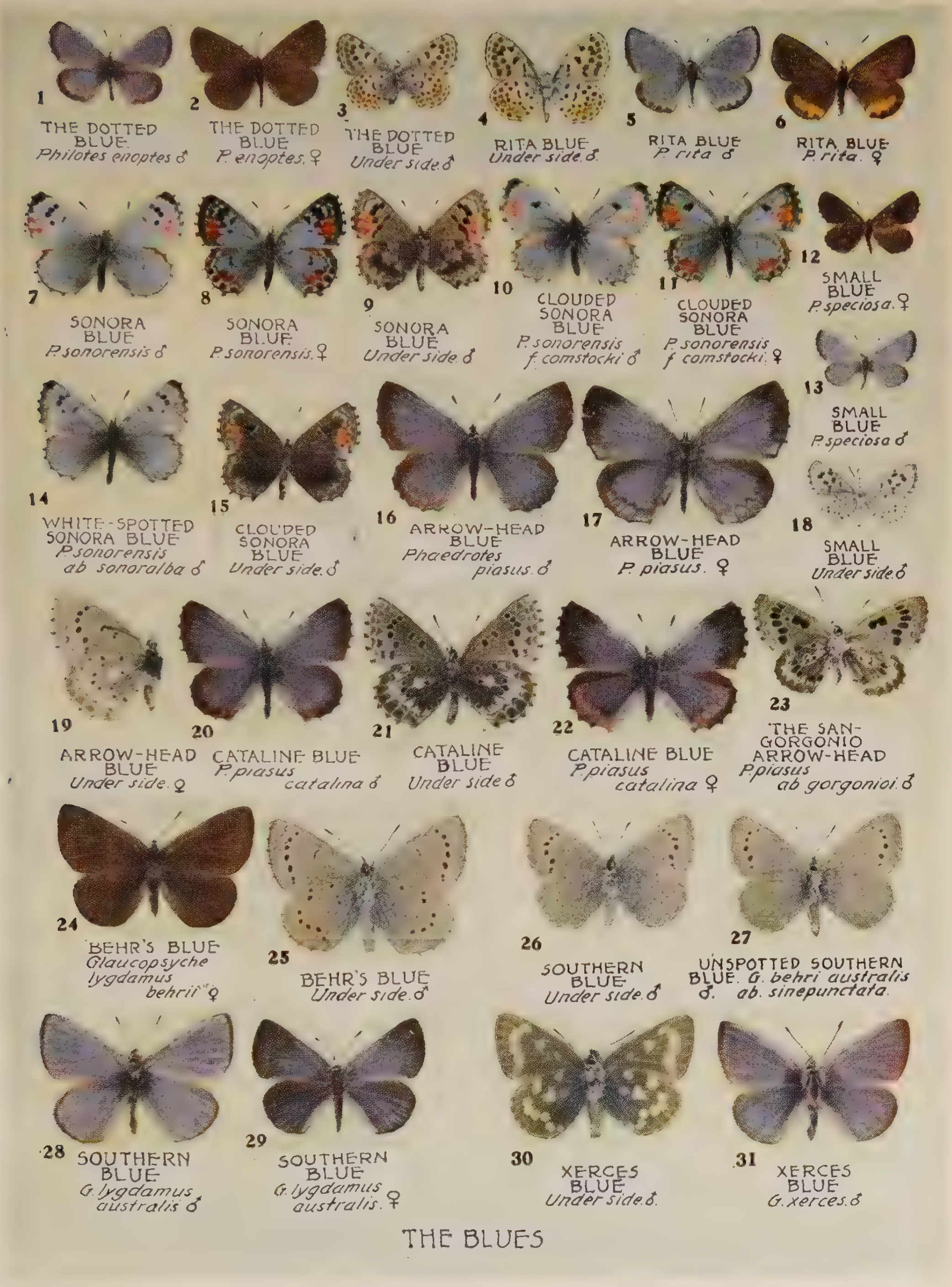
THE BLUES

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 56

| | | Text Page |
|---|---|---|
| Fig. 1. | *Philotes enoptes* Bdv. ♂, Ridge Road, Sierra Madre Mts., Cal. June 15, 1920 | 193 |
| Fig. 2. | *P. enoptes* Bdv. ♀, Mammoth Camp, Mono Co., Cal. July 19, 1922 | 193 |
| Fig. 3. | *P. enoptes* Bdv. ♂, under side, Ridge Road, Sierra Madre Mts., Cal. July 15, 1920 | 193 |
| Fig. 4. | *P. rita* B. & McD. ♂, under side, Huachuca Mts., Ariz. Aug. 16, 1922. Courtesy Dr. Wm. Barnes | 193 |
| Fig. 5. | *P. rita* B. & McD. ♂, Huachuca Mts., Ariz. (Compared with type) Aug. 16, 1922. Courtesy Dr. Wm. Barnes | 193 |
| Fig. 6. | *P. rita* B. & McD. ♀, Huachuca Mts., Ariz. (Compared with type) Aug. 16, 1922. Courtesy Dr. Wm. Barnes | 193 |
| Fig. 7. | *P. sonorensis* F. & F. ♂, Azusa, Los Angeles Co., Cal. Feb. 28, '26. | 194 |
| Fig. 8. | *P. sonorensis* F. & F. ♀, Azusa, Los Angeles Co., Cal. April 20, 1922. | 194 |
| Fig. 9. | *P. sonorensis* F. & F. ♂, under side, Azusa, Cal. March 1, 1925 | 194 |
| Fig. 10. | *P. sonorensis comstocki* Gunder. ♂, (Holotype) Duarte, Cal. March 15, 1922. Courtesy Jean Gunder | 196 |
| Fig. 11. | *P. sonorensis comstocki* Gunder. ♀, (Allotype) Duarte, Cal. February 20, 1922. Courtesy Jean Gunder | 196 |
| Fig. 12. | *P. speciosa* Hy. Edw. ♀, Mojave Desert, Cal. April 16, 1923 | 194 |
| Fig. 13. | *P. speciosa* Hy. Edw. ♂, Mojave Desert, Cal. April 15, 1923 | 194 |
| Fig. 14. | *P. sonorensis* ab. *sonoralba* Wats. & Comst. ♂, Azusa, Cal. March 5, 1924 | 195 |
| Fig. 15. | *P. sonorensis comstocki* Gunder. ♂, under side, Azusa, Cal. April 20, 1922 | 196 |
| Fig. 16. | *Phaedrotes piasus* Bdv. ♂, Mineral King, Tulare Co., Cal. June 24. Courtesy Dr. Wm. Barnes | 196 |
| Fig. 17. | *P. piasus* Bdv. ♀, Shasta Co., Cal. July 6, 1921 | 196 |
| Fig. 18. | *Philotes speciosa* Hy. Edw. ♂, under side, Mojave Desert, Cal. April 15, 1923 | 194 |
| Fig. 19. | *Phaedrotes piasus* Bdv. ♀, under side, Shasta Co., Cal. July 6, '21. | 196 |
| Fig. 20. | *P. piasus catalina* Reak. ♂, Glendale, Cal. March 25, 1923 | 197 |
| Fig. 21. | *P. piasus catalina* Reak. ♂, under side, Glendale, Cal. Mch. 25, '23. | 197 |
| Fig. 22. | *P. piasus catalina* Reak. ♀, Glendale, Cal. March 25, 1923 | 197 |
| Fig. 23. | *P. piasus catalina* ab. *gorgonioi* Gunder. ♂, under side, (type) San Gorgonio Mt., San Bernardino Co., Cal. June 13, 1921. Courtesy Jean Gunder | 197 |
| Fig. 24. | *Glaucopsyche lygdamus behrii* Edw. ♀, Mill Valley, Cal. Apr. 4, '18. | 197 |
| Fig. 25. | *G. lygdamus behrii* Edw. ♂, under side, Portola, Cal. Apr. 12, '18. | 197 |
| Fig. 26. | *G. lygdamus australis* Grin. ♂, under side, Mint Canyon, Los Angeles Co., Cal. May 1, 1921 | 198 |
| Fig. 27. | *G. lygdamus australis* ab. *sinepunctata* Comst. ♂, under side, (type) Mint Canyon, Cal. May 1, 1921 | 198 |
| Fig. 28. | *G. lygdamus australis* Grin. ♂, (type) Pasadena, Cal. May 20, 1907. Courtesy Jean Gunder | 198 |
| Fig. 29 | *G. lygdamus australis* Grin. ♀, Griffith Park, Los Angeles, Cal. April 10, 1921 | 198 |
| Fig. 30. | *G. xerces* Bdv. ♂, under side, Lake Merced, San Francisco Co., Cal. March. Courtesy J. E. Cottle | 199 |
| Fig. 31. | *G. xerces* Bdv. ♂, Lake Merced, S. F. Co., Cal. March. Courtesy J. E. Cottle | 199 |



1 THE DOTTED BLUE *Philotes enoptes* ♂

2 THE DOTTED BLUE *P. enoptes.* ♀

3 THE DOTTED BLUE Under side ♂

4 RITA BLUE Under side. ♂

5 RITA BLUE *P. rita* ♂

6 RITA BLUE *P. rita.* ♀

7 SONORA BLUE *P. sonorensis* ♂

8 SONORA BLUE *P. sonorensis.* ♀

9 SONORA BLUE Under side ♂

10 CLOUDED SONORA BLUE *P. sonorensis f. comstocki* ♂

11 CLOUDED SONORA BLUE *P. sonorensis f. comstocki.* ♀

12 SMALL BLUE *P. speciosa.* ♀

13 SMALL BLUE *P. speciosa* ♂

14 WHITE-SPOTTED SONORA BLUE *P. sonorensis ab sonoralba* ♂

15 CLOUDED SONORA BLUE Under side. ♂

16 ARROW-HEAD BLUE *Phaedrotes piasus.* ♂

17 ARROW-HEAD BLUE *P. piasus.* ♀

18 SMALL BLUE Under side. ♂

19 ARROW-HEAD BLUE Under side. ♀

20 CATALINE BLUE *P. piasus catalina* ♂

21 CATALINE BLUE Under side ♂

22 CATALINE BLUE *P. piasus catalina* ♀

23 THE SAN-GORGONIO ARROW-HEAD *P. piasus ab gorgonioi.* ♂

24 BEHR'S BLUE *Glaucopsyche lygdamus behrii* ♀

25 BEHR'S BLUE Under side. ♂

26 SOUTHERN BLUE Under side. ♂

27 UNSPOTTED SOUTHERN BLUE. *G. behri australis* ♂. *ab. sinepunctata.*

28 SOUTHERN BLUE *G. lygdamus australis* ♂

29 SOUTHERN BLUE *G. lygdamus australis.* ♀

30 XERCES BLUE Under side. ♂

31 XERCES BLUE *G. xerces.* ♂

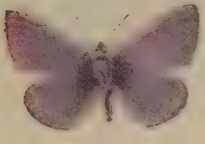
THE BLUES

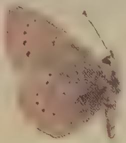
All figures slightly reduced

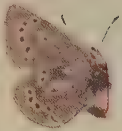
Copyright 1927, John A. Comstock

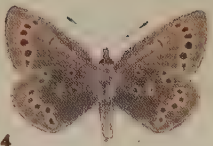
## EXPLANATION OF PLATE 57

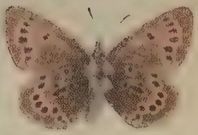
| | | Text Page |
|---|---|---|
| Fig. 1. | *Glaucopsyche xerces polyphemus* Bdv. ♂, Lake Merced, San Mateo Co., Cal. April 7, 1907 | 200 |
| Fig. 2. | *G. xerces polyphemus* Bdv. ♂, under side, Lake Merced, San Mateo Co., Cal. March 22, 1908 | 200 |
| Fig. 3. | *G. xerces* ab. *antiacis* Bdv. ♂, under side, Parkside, San Francisco, Cal. March 31, 1918 | 200 |
| Fig. 4. | *G. xerces mertila* Edw. ♂, under side, Parkside, San Francisco, Cal. March 31, 1918 | 200 |
| Fig. 5. | *G. xerces mertila* ab. *huguenini* Gunder. ♂, under side, San Francisco, Cal. April 24, 1917. Type. Courtesy Jean Gunder | 200 |
| Fig. 6. | *Lycaenopsis pseudargiolus echo* Edw. ♂, Griffith Park, Los Angeles, Cal., June 7, 1921 | 200 |
| Fig. 7. | *L. pseudargiolus echo* Edw. ♂, under side, San Gabriel Canyon, Los Angeles Co., Cal. March 1, 1925 | 200 |
| Fig. 8. | *L. pseudargiolus echo* Edw. ♀, San Gabriel Canyon, Los Angeles Co., Cal. March 1, 1925 | 200 |
| Fig. 9. | *L. pseudargiolus arizonensis* Edw. ♀, Glacier Point, Yosemite, Cal. June 28, 1921 | 201 |
| Fig. 10. | *Polygonus lividus arizonensis* Skin. ♂, Baboquivaria Mts., Ariz. August. Courtesy Drs. Barnes and Benjamin | 203 |
| Fig. 11. | *P. lividus arizonensis* Skin. ♂, under side, San Diego, Cal. August 24, 1925. Courtesy John C. Fortiner | 203 |
| Fig. 12. | *Epargyreus tityrus* Fabr. ♂, Shasta Co., Cal July 1, 1921 | 203 |
| Fig. 13. | *E. tityrus* Fabr. ♂, under side, Wawona nr. Yosemite, Cal. June 27, 1921 | 203 |
| Fig. 14. | *E. exadeus* Cram. ♂, Muzo, Colombia. No data | 204 |
| Fig. 15. | *Goniurus proteus* L. ♂, under side, Indian Wells, Coachella Valley, Cal. Sept., 1922 | 204 |
| Fig. 16. | *G. proteus* L. ♂, Stemper, Fla. Oct. 20, 1911 | 204 |
| Fig. 17. | *G. dorantes rauterbergi* Skin. ♂, under side, Baboquivaria Mts., Ariz. Sept. 15, 1923 | 205 |

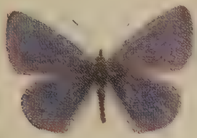

1 POLYPHEMUS BLUE *G. xerces polyphemus.* ♂

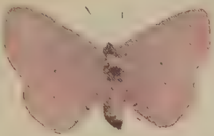

2 POLYPHEMUS BLUE Under side. ♂

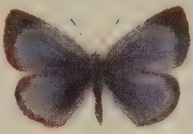

3 THE EYED BLUE *G. xerces antiacis.* ♂

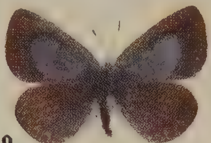

4 MERTILA BLUE *G. xerces mertila* ♂ Under side.


5 HUGUENIN'S BLUE *G. xerces mertila.* ♂ *ab. huguenini.* Under s.

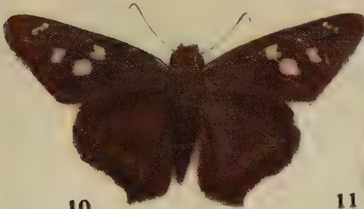

6 ECHO BLUE *Lycaenopsis pseudargiolus f. echo.* ♂

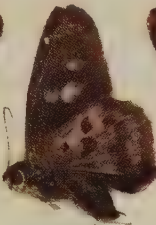

7 ECHO BLUE Under side ♂

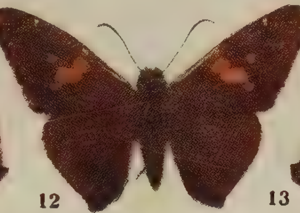

8 ECHO BLUE *L. pseudargiolus f. echo* ♀

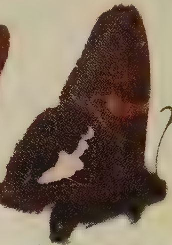

9 ARIZONA BLUE *L. pseudargiolus f. arizonensis* ♀

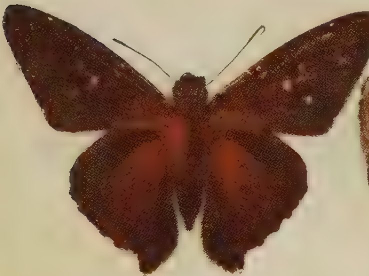
## THE BLUES

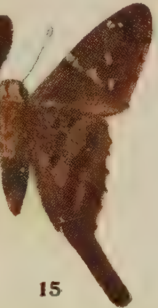

10 SKINNER'S ARIZONA SKIPPER *Polygonus lividus f. arizonensis* ♂

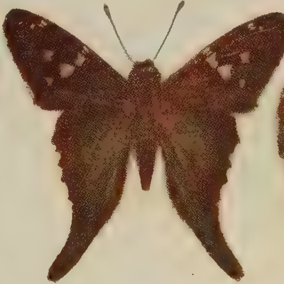

11 SKINNER'S ARIZONA SKIPPER Under side.

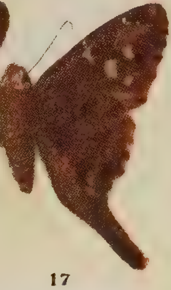

12 SILVER SPOTTED SKIPPER *Epargyreus tityrus*


13 SILVER SPOTTED SKIPPER Under side.


14 EXADEUS SKIPPER *Epargyreus exadeus* ♂


15 LONG-TAILED SKIPPER Under side.


16 LONG-TAILED SKIPPER *Goniurus proteus* ♂


17 RAUTERBERG'S SKIPPER *G. dorantes rauterbergi.* Under side. ♂

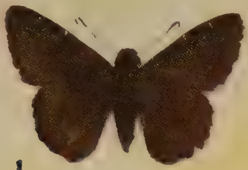
## THE SKIPPERS

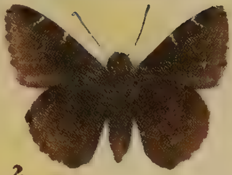
All figures slightly reduced

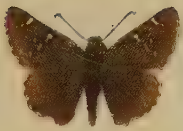
Copyright 1927, John A. Comstock

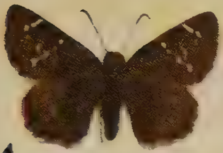
# EXPLANATION OF PLATE 58

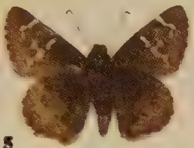
| | | Text Page |
|---|---|---|
| Fig. 1. | *Thorybes mexicana* H. S. ♂, Millard's Canyon, Los Angeles Co., Cal. May 27, 1920 | 206 |
| Fig. 2. | *T. mexicana* H. S. ♂, under side, San Jacinto Mts., Cal. June 1, 1924 | 206 |
| Fig. 3. | *T. nevada* Scud. ♂, Glacier Point, Yosemite, Cal. July 1, 1921 | 206 |
| Fig. 4. | *T. nevada* Scud. ♀, Mammoth Camp, Mono Co., Cal. July 16, 1922 | 206 |
| Fig. 5. | *T. nevada* Scud. ♂, under side, Mammoth Camp, Mono Co., Cal. July 16, 1922 | 206 |
| Fig. 6. | *Urbanus ruralis* Bdv. ♂, Fitzgerald, B. C., Canada. May 22, 1922 | 206 |
| Fig. 7. | *U. ruralis* Bdv. ♀, Del Monte, Cal. April 3, 1920 | 206 |
| Fig. 8. | *U. ruralis* Bdv. ♂, under side, Fitzgerald, B. C., Canada. May 14, 1922 | 206 |
| Fig. 9. | *U. scriptura* Bdv. ♂, Prescott, Ariz. April 7. Courtesy Drs. Barnes & Benjamin | 207 |
| Fig. 10. | *U. scriptura* Bdv. ♀, Phoenix, Ariz. August 16 | 207 |
| Fig. 11. | *U. scriptura* Bdv. ♂, under side, Mojave Co., Ariz. Sept. 24 | 207 |
| Fig. 12. | *U. tessellata occidentalis* Skin. ♂, Chino Canyon, Coachella Valley, Cal. April 1, 1922 | 207 |
| Fig. 13. | *U. tessellata occidentalis* Skin. ♀, under side, Haiwee, Owen's Valley, Cal. June, 1921 | 207 |
| Fig. 14. | *U. ericetorum* Bdv. ♂, Bouquet Canyon, Los Angeles, Co., Cal. June 3, 1923 | 209 |
| Fig. 15. | *U. ericetorum* Bdv. ♀, Los Angeles, Cal. May 15, 1921 | 209 |
| Fig. 16. | *U. ericetorum* Bdv. ♂, under side, Bouquet Canyon, Los Angeles Co., Cal. June 3, 1923 | 209 |
| Fig. 17. | *Antigonus pulverulenta* R. Feld. ♂, Baboquivaria Mts., Ariz. January 15, 1924 | 210 |
| Fig. 18. | *A. pulverulenta* R. Feld. ♂, under side, Baboquivaria Mts., Ariz. January 15, 1924 | 210 |
| Fig. 19. | *Pholisora alpheus* Edw. ♂, Fertilla, Cal. July 30, 1921 | 210 |
| Fig. 20. | *P. alpheus* Edw. ♀, Indio, Coachella Valley, Cal. March 14, 1926 | 210 |
| Fig. 21. | *P. alpheus* Edw. ♂, under side, Fertilla, Cal. August 29, 1921 | 210 |
| Fig. 22. | *P. libya* Scud. ♂, under side, Indian Wells, Coachella Valley, Cal. September 30, 1921 | 211 |
| Fig. 23. | *P. libya* Scud. ♂, Indian Wells, Coachella Valley, Cal. September 30, 1921 | 211 |
| Fig. 24. | *P. libya* Scud. ♀, Indian Wells, Coachella Valley, Cal. September 30, 1921 | 211 |
| Fig. 25. | *P. catullus* Fabr. ♂, Round Valley, Inyo Co., Cal. July 29, 1922 | 211 |
| Fig. 26. | *P. catullus* Fabr. ♂, (variant) Los Angeles, Cal. No data | 211 |
| Fig. 27. | *P. catullus* Fabr. ♂, under side, Virginia City, Nev. July 27, '23 | 211 |

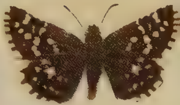

1
MEXICAN DUSKY-WING *Thorybes mexicana* ♂

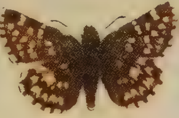

2
MEXICAN DUSKY-WING. *Under side.*

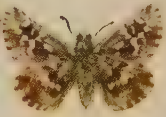

3
NEVADA DUSKY-WING *Thorybes nevada* ♂

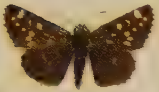

4
NEVADA DUSKY-WING *T. nevada.* ♀

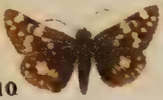

5
NEVADA DUSKY-WING *Under side.*


6
TWO-BANDED SKIPPER *Urbanus ruralis.* ♂

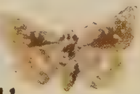

7
TWO-BANDED SKIPPER *U. ruralis.* ♀

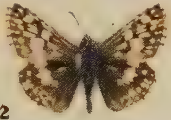

8
TWO-BANDED SKIPPER *Under side.* ♂.

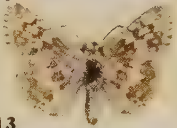

9

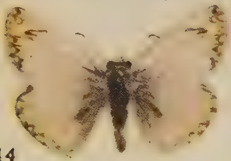

10

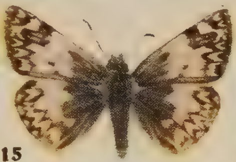
SMALL CHECKERED SKIPPER ♂ *Urbanus scriptura* ♀

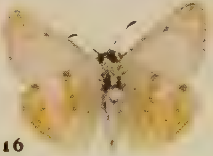

11
SMALL CHECKERED SKIPPER *Under side* ♂

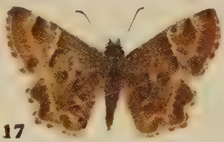

12
WESTERN CHECKERED SKIPPER. *Urbanus tessellata occidentalis.*

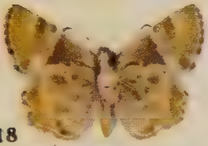

13
WESTERN CHECKERED SKIPPER. *Under side.*

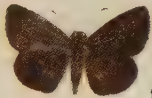

14
LARGE WHITE SKIPPER. *Urbanus ericetorum.* ♂

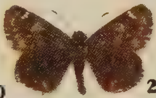

15
LARGE WHITE SKIPPER *U. ericetorum.* ♀


16
LARGE WHITE SKIPPER *Under side.* ♂.

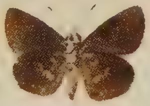

17
THE POWDERED SKIPPER. *Antigonus pulverulenta* ♂

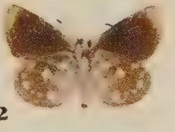

18
THE POWDERED SKIPPER *Under side.* ♂.

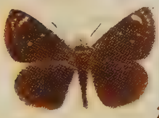

19

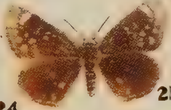

20

ALPHEUS ♂. SOOTY-WING ♀ *Pholisora alpheus.*

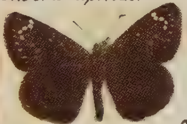

21
ALPHEUS SOOTY-WING *Under side* ♂

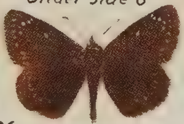

22
MOHAVE SOOTY-WING *Under side* ♂

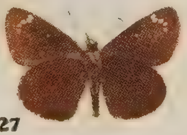

23


24

MOHAVE SOOTY-WING ♂, *P. libya* ♀


25
THE SOOTY-WING. *P. catullus* ♂


26
THE SOOTY-WING. *P. catullus.* ♂


27
THE SOOTY-WING. *Under side.* ♂

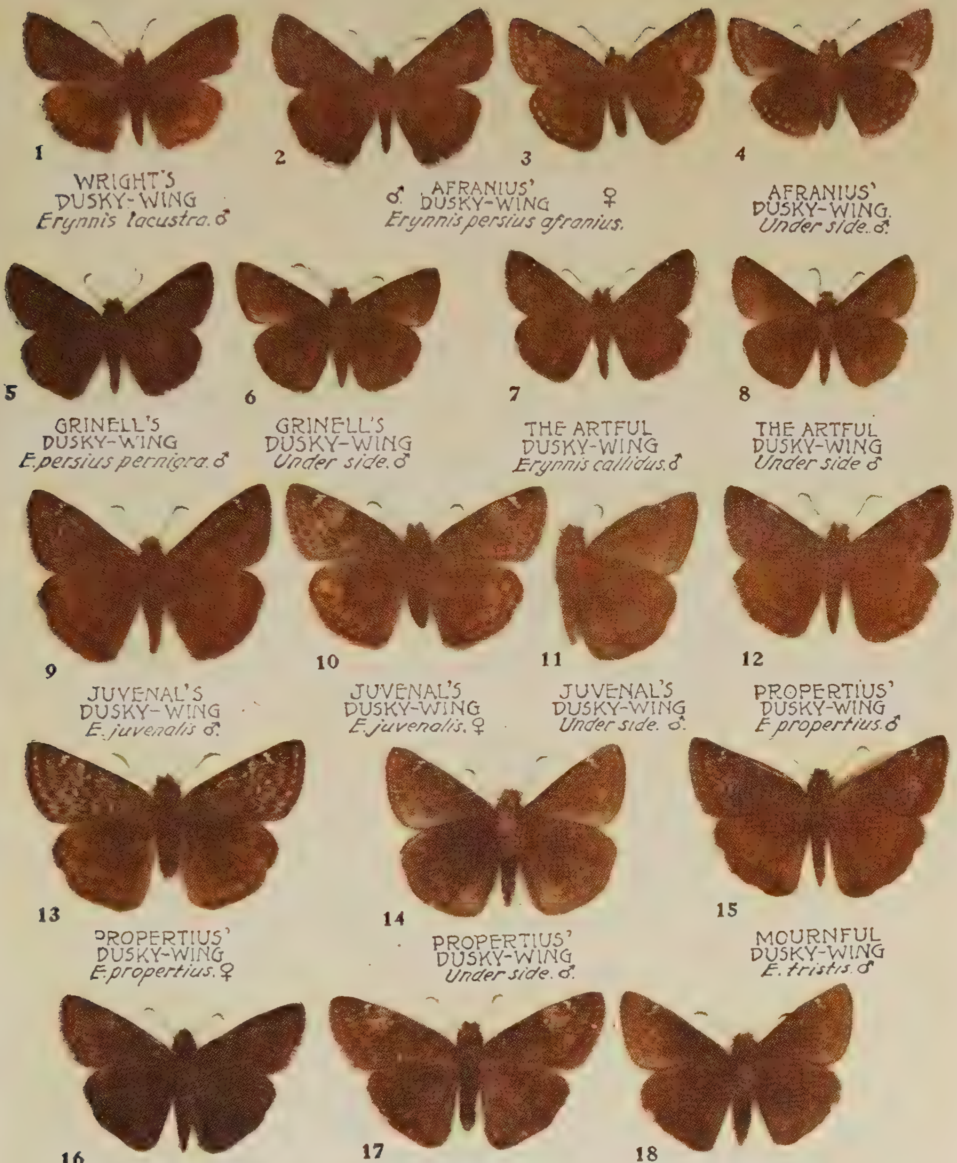
THE SKIPPERS

All figures slightly reduced

Copyright 1927, John A. Comstock

## EXPLANATION OF PLATE 59

| | | Text Page |
|---|---|---|
| Fig. 1. | *Erynnis lacustra* Wright ♂, Mt. Wilson, Cal. El. 5,986 ft. June 7, 1903 | 212 |
| Fig. 2. | *E. persius afranius* Lint. ♂, Base of Teton Range, Wyo. July 11, 1925. Det. by A. W. Lindsey | 212 |
| Fig. 3. | *E. persius afranius* Lint. ♀, Moran, Wyo. July 11, 1925 | 212 |
| Fig. 4. | *E. persius afranius* Lint. ♂, under side, San Gabriel Canyon, Los Angeles, Co., Cal. March 1, 1925 | 212 |
| Fig. 5. | *E. persius pernigra* Grin. ♂, Mt. Tamalpais, Marin Co., Cal. April 4, 1908 | 213 |
| Fig. 6. | *E. persius pernigra* Grin. ♂, under side, Marin Co., Cal. April 22, 1903 | 213 |
| Fig. 7. | *E. callidus* Grin. ♂, San Jacinto Mts., Cal. June 1, 1924. Det. by A. W. Lindsey | 213 |
| Fig. 8. | *E. callidus* Grin. ♂, under side, San Jacinto Mts., Cal. June 1, 1924 | 213 |
| Fig. 9. | *E. juvenalis* Fabr. ♂, San Jacinto Mts., Cal. June 1, 1924 | 213 |
| Fig. 10. | *E. juvenalis* Fabr. ♀, Coram, N. Y. May 25 | 213 |
| Fig. 11. | *E. juvenalis* Fabr. ♂, under side, Shasta Co., Cal. June 28, 1921 | 213 |
| Fig. 12. | *E. propertius* Scud. & Burg. ♂, Los Angeles, Cal. April 10, 1921 | 214 |
| Fig. 13. | *E. propertius* Scud. & Burg. ♀, Millard's Canyon, Los Angeles Co., Cal. March 15, 1925 | 214 |
| Fig. 14. | *E. propertius* Scud. & Burg. ♂, under side, Millard's Canyon, Los Angeles Co., Cal. May 16. 1920 | 214 |
| Fig. 15. | *E. tristis* Bdv. ♂, Millard's Canyon, Los Angeles Co., Cal. March 16, 1925 | 214 |
| Fig. 16. | *E. funeralis* Scud. & Burg. ♂, Pasadena, Cal. July 12, '20. | 214 |
| Fig. 17. | *E. funeralis* Scud. & Burg. ♀, Pasadena, Cal. July 12, '20. | 214 |
| Fig. 18. | *E. funeralis* Scud. & Burg. ♂, under side, Los Angeles, Cal. February 15, 1918 | 214 |



1 WRIGHT'S DUSKY-WING *Erynnis lacustra.* ♂

2 ♂ 3 ♀ AFRANIUS' DUSKY-WING *Erynnis persius afranius.*

4 AFRANIUS' DUSKY-WING. *Under side.* ♂

5 GRINELL'S DUSKY-WING *E. persius pernigra.* ♂

6 GRINELL'S DUSKY-WING *Under side.* ♂

7 THE ARTFUL DUSKY-WING *Erynnis callidus.* ♂

8 THE ARTFUL DUSKY-WING *Under side* ♂

9 JUVENAL'S DUSKY-WING *E. juvenalis* ♂

10 JUVENAL'S DUSKY-WING *E. juvenalis.* ♀

11 JUVENAL'S DUSKY-WING *Under side.* ♂

12 PROPERTIUS' DUSKY-WING *E. propertius.* ♂

13 PROPERTIUS' DUSKY-WING *E. propertius.* ♀

14 PROPERTIUS' DUSKY-WING *Under side.* ♂

15 MOURNFUL DUSKY-WING *E. tristis.* ♂

16 FUNEREAL DUSKY-WING *E. funeralis* ♂

17 FUNEREAL DUSKY-WING *E. funeralis.* ♀

18 FUNEREAL DUSKY-WING *Under side* ♂

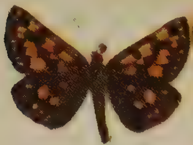
THE DUSKY-WING SKIPPERS

All figures slightly reduced

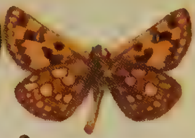
Copyright 1927, John A. Comstock

# EXPLANATION OF PLATE 60

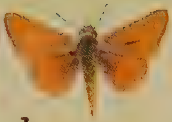
| | | Text Page |
|---|---|---|
| Fig. 1. | *Pamphilidia palæmon* Pall. ♂, Continental Divide w. of Yellowstone Park. July 9, 1925 | 216 |
| Fig. 2. | *P. palæmon* Pall. ♂, under side, Continental Divide w. of Yellowstone Park. July 9, 1925 | 216 |
| Fig. 3. | *Copæodes aurantiaca* Hew. ♂, Santa Rita Mts., Ariz. Apr. 17, 1918. | 216 |
| Fig. 4. | *C. aurantiaca* Hew. ♀, Cochise Co., Ariz. May 9, 1918 | 216 |
| Fig. 5. | *C. aurantiaca* Hew. ♂, under side, Chiricahua Mts., Cochise Co., Ariz. May 23, 1918 | 216 |
| Fig. 6. | *Pseudocopæodes eunus* Edw. ♂, Jacumba, San Diego Co., Cal. September 24, 1924 | 217 |
| Fig. 7. | *P. eunus* Edw. ♀, Jacumba, San Diego Co., Cal. Sept. 24, 1924. | 217 |
| Fig. 8. | *P. eunus* Edw. ♀, Round Valley, Inyo Co., Cal. July 29, 1922 | 217 |
| Fig. 9. | *P. eunus* Edw. ♀, under side, Round Valley, Inyo Co., Cal. July 29, 1922 | 217 |
| Fig. 10. | *Hesperia morrisoni* Edw. ♂, under side, Colorado Springs, Colo. No date. Courtesy Drs. Barnes & Benjamin | 217 |
| Fig. 11. | *H. columbia* Scud. ♂, under side, Little Mt. San Bernardino, Cal. April 21, 1892. Courtesy Drs. Barnes & Benjamin | 217 |
| Fig. 12. | *H. columbia* Scud. ♀, "Calif." No data. Courtesy Drs. Barnes & Benjamin | 217 |
| Fig. 13. | *H. comma idaho* Edw. ♂, Warner Lake, So. E. Oregon. Aug. 8, '25. | 218 |
| Fig. 14. | *H. comma idaho* Edw. ♀, Davis Creek, Modoc Co., Cal. August 6, 1922. Courtesy A. W. Lindsey | 218 |
| Fig. 15. | *H. comma idaho* Edw. ♀, under side, Goose Lake Valley, Modoc Co., Cal. August 7, 1922 | 218 |
| Fig. 16. | *H. juba* Scud. ♂, Palm Springs, Coachella Valley, Cal. April 20, '20 | 218 |
| Fig. 17. | *H. juba* Scud. ♀, Chiloquin, Oregon. August 12, 1922 | 218 |
| Fig. 18. | *H. juba* Scud. ♂, under side, Chiloquin, Oregon. August 12, 1922. | 218 |
| Fig. 19. | *H. comma oregonia* Edw. ♂, under side, Indian Wells, Coachella Valley, Cal. October 28, 1922 | 218 |
| Fig. 20. | *H. viridis* Edw. ♂, Santa Rita Mts., Ariz. April. Det. A. W. Lindsey | 219 |
| Fig. 21. | *H. viridis* Edw. ♀, under side, Idylwilde, San Jacinto Mts., Cal. June 10, 1925 | 219 |
| Fig. 22. | *H. viridis* Edw. ♀, Mammoth Camp, Mono Co., Cal. July 23, 1922. | 219 |
| Fig. 23. | *H. nevada* Scud. ♂, Chiloquin, Oregon. August 12, 1922 | 219 |
| Fig. 24. | *H. nevada* Scud. ♀, under side, Mammoth Camp, Mono Co., Cal. July 23, 1922 | 219 |
| Fig. 25. | *H. nevada* Scud. ♀, Mammoth Camp, Mono Co., Cal. July 23, 1922. | 219 |



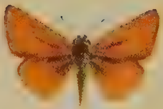
ARCTIC SKIPPER
*Pamphilidia palæmon.* ♂



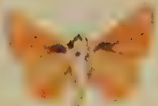
2
ARCTIC SKIPPER
*Under side.*



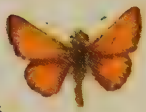
3
HEWITSON'S SKIPPER
*Copaeodes aurantiaca.* ♂



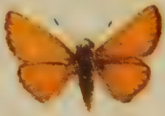
4
HEWITSON'S SKIPPER
*C. aurantiaca.* ♀



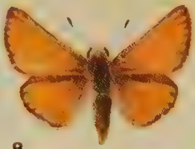
5
HEWITSON'S SKIPPER
*Under side.* ♂



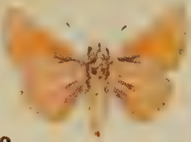
6
EUNUS SKIPPER
*Pseudocopæodes eunus.* ♂



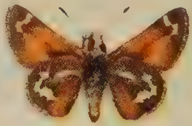
7
EUNUS SKIPPER
*P. eunus.* ♀



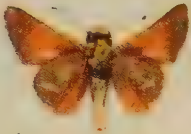
8
EUNUS SKIPPER
*P. eunus* ♀



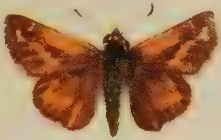
9
EUNUS SKIPPER
*Under side.* ♀



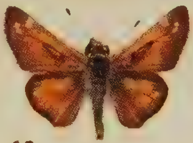
10
MORRISON'S SKIPPER
*H. morrisoni. Under s.* ♂



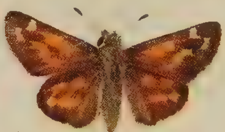
11
COLUMBIAN SKIPPER
*Under side.* ♂



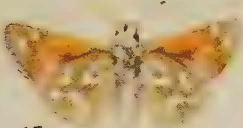
12
COLUMBIAN SKIPPER
*Hesperia columbia* ♀



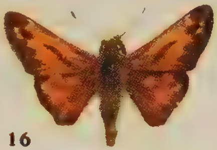
13
IDAHO SKIPPER
*H. idaho.* ♂



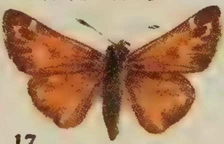
14
IDAHO SKIPPER
*H. idaho.* ♀



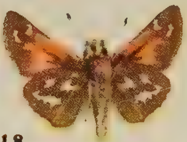
15
IDAHO SKIPPER
*Under side.* ♀



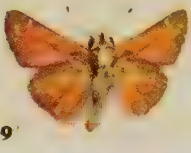
16
JUBA SKIPPER
*Hesperia juba.* ♂



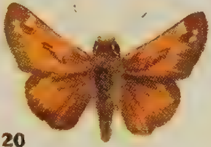
17
JUBA SKIPPER
*H. juba* ♀



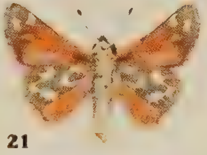
18
JUBA SKIPPER
*Under side.* ♂



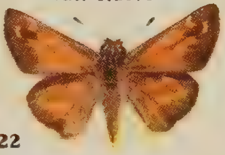
19
OREGON SKIPPER
*H. oregonia. Under s.* ♂



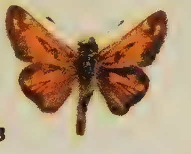
20
GREEN SKIPPER
*H. viridis.* ♂.



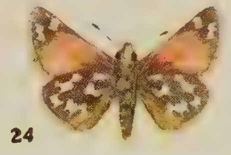
21
GREEN SKIPPER
*Under side.* ♀



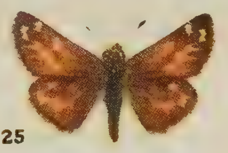
22
GREEN SKIPPER
*H. viridis* ♀



23
NEVADA SKIPPER
*H. nevada.* ♂



24
NEVADA SKIPPER
*Under side* ♀



25
NEVADA SKIPPER
*H. nevada.* ♀

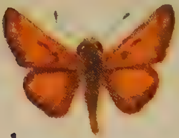
THE SKIPPERS

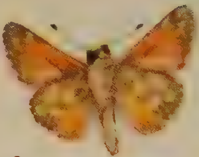
All figures slightly reduced

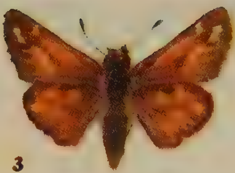
Copyright 1927, John A. Comstock

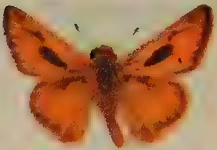
# EXPLANATION OF PLATE 61

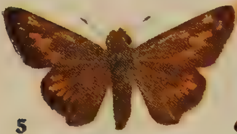
| | | Text Page |
|---|---|---|
| Fig. 1. | *Hesperia ruricola* Bdv. ♂, Ridge Route, Tejon Mts., Cal. June 21, 1923 | 219 |
| Fig. 2. | *H. ruricola* Bdv. ♂, under side, Near Los Angeles, Cal. July 10, 1920 | 219 |
| Fig. 3. | *H. ruricola* Bdv. ♀, Ridge Route, Tejon Mts., Cal. June 21, 1923 | 219 |
| Fig. 4. | *Hylephila phylæus* Dru. ♂, Los Angeles, Cal. Sept. 17, 1916 | 220 |
| Fig. 5. | *H. phylæus* Dru. ♀, Los Angeles, Cal. Sept. 17, 1916 | 220 |
| Fig. 6. | *H. phylæus* Dru. ♂, under side, Los Angeles, Cal. Sept. 17, 1916 | 220 |
| Fig. 7. | *Ochlodes sylvanoides* Bdv. ♂, Coachella Valley, San Bernardino Co., Cal. October 28, 1922 | 221 |
| Fig. 8. | *O. sylvanoides* Bdv. ♂, under side, Bear Creek, Dorris, Cal. Oct. 18, 1922 | 221 |
| Fig. 9. | *O. sylvanoides* Bdv. ♀, Coachella Valley, Cal. October 28, 1922 | 221 |
| Fig. 10. | *O. nemorum* Bdv. ♂, Griffith Park, Los Angeles, Cal. June 15, '20. | 221 |
| Fig. 11. | *O. nemorum* Bdv. ♀, Griffith Park, Los Angeles, Cal. June 12, '21. | 221 |
| Fig. 12. | *O. nemorum* Bdv. ♂, under side, Eaton's Canyon, Los Angeles Co., Cal. June 7, 1920 | 221 |
| Fig. 13. | *O. nemorum pratincola* Bdv. ♂, from Dr. Oberthur's illustration of the type. The left portion of the figure represents the under side | 221 |
| Fig. 14. | *O. agricola* Bdv. ♂, Griffith Park, Los Angeles, Cal. June 15, 1919. | 222 |
| Fig. 15. | *O. agricola* Bdv. ♂, under side, Los Angeles, Cal. June 12, 1917 | 222 |
| Fig. 16. | *O. yuma* Edw. ♂, Olancha, Inyo Co., Cal. June 20, 1925. Courtesy Jean Gunder | 222 |
| Fig. 17. | *O. yuma* Edw. ♂, under side, Olancha, Inyo Co., Cal. June 20, 1925. | 222 |
| Fig. 18. | *O. yuma* Edw. ♀, Olancha, Inyo Co., Cal. June 8, 1915. Courtesy Drs. Barnes & Benjamin | 222 |
| Fig. 19. | *O. agricola* Bdv. ♀, Griffith Park, Los Angeles, Cal. June 5, 1921 | 222 |
| Fig. 20. | *Polites sonora* Scud. ♂, Monache Meadows, Tulare Co., Cal. August 17, 1917 | 222 |
| Fig. 21. | *P. sonora* Scud. ♀, Monache Meadows, Tulare Co., Cal. Aug. 25, 1917 | 222 |
| Fig. 22. | *P. sonora* Scud. ♂, under side, Wawona, near Yosemite, Cal. June 27, 1921 | 222 |
| Fig. 23. | *P. mardon* Edw. ♂, Seattle, Wash. No date. Courtesy Drs. Barnes & Benjamin | 222 |
| Fig. 24. | *P. sabuleti* Bdv. ♂, Round Valley, Inyo Co., Cal. July 29, 1922 | 223 |
| Fig. 25. | *P. sabuleti* Bdv. ♀, San Gabriel Mts., Cal. May 27, 1925 | 223 |
| Fig. 26. | *P. sabuleti* Bdv. ♂, under side, Round Valley, Inyo Co., Cal. July 29, 1922 | 223 |
| Fig. 27. | *P. sabuleti tecumseh* Grin. ♂, Tioga Pass, Yosemite, Cal. August 3, 1922 | 223 |
| Fig. 28. | *P. sabuleti tecumseh* Grin. ♀, Tioga Pass, Yosemite, Cal. August 3, 1922 | 223 |
| Fig. 29. | *P. sabuleti comstocki* Gunder ♂, under side, Round Valley, Inyo Co., Cal. July 29, 1922 | 223 |
| Fig. 30. | *P. sabuleti tecumseh* Grin. ♂, under side, Tuolumne Meadows, Yosemite, Cal. August 4, 1922 | 223 |
| Fig. 31. | *P. sabuleti tecumseh* Grin. ♀, under side, Tioga Pass, Yosemite, Cal. August 3, 1922 | 223 |

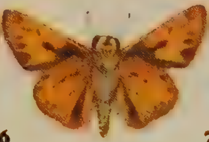

1
RUSTIC SKIPPER
*Hesperia ruricola* ♂

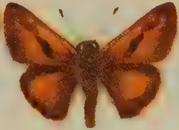

2
RUSTIC SKIPPER
*Under side.* ♂

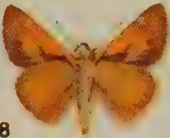

3
RUSTIC SKIPPER
*H. ruricola.* ♀

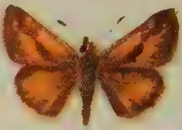

4
FIERY SKIPPER.
*Hylephila phylaeus.* ♂.

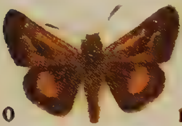

5
FIERY SKIPPER
*H. phylaeus.* ♀

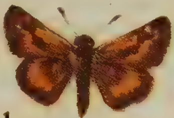

6
FIERY SKIPPER
*Under side* ♂

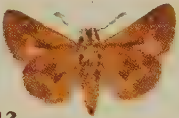

7
WOODLAND SKIPPER
*Ochlodes sylvanoides.* ♂

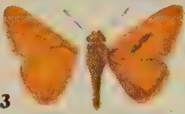

8
WOODLAND SKIPPER
*Under side.* ♂.

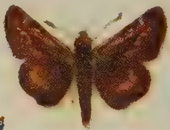

9
WOODLAND SKIPPER
*O. sylvanoides.* ♀

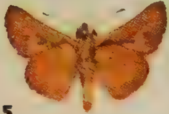

10
FOREST SKIPPER
*O nemorum* ♂

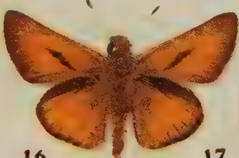

11
FOREST SKIPPER
*O nemorum.* ♀

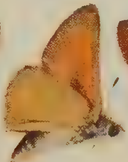

12
FOREST SKIPPER
*Under side.* ♂.

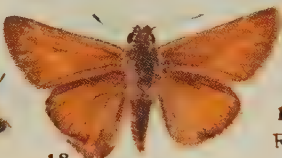

13
MEADOW SKIPPER
*O nemorum pratincola*

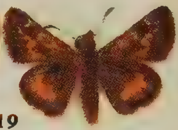

14
RURAL SKIPPER
*O. agricola* ♂.

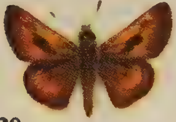

15
RURAL SKIPPER
*Under side.* ♂

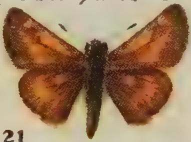

16
THE YUMA SKIPPER
*Ochlodes yuma* ♂

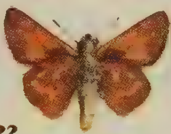

17
YUMA SKIPPER
*Under side.* ♂

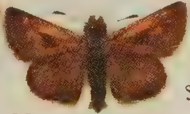

18
YUMA SKIPPER
*O. yuma.* ♀

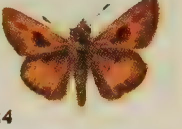

19
RURAL SKIPPER
*O. agricola* ♀

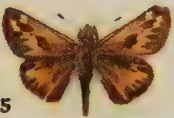

20
SONORA SKIPPER
*Polites sonora* ♂

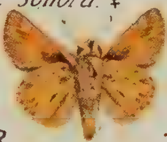

21
SONORA SKIPPER
*P. sonora.* ♀

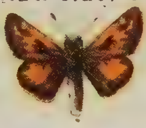

22
SONORA SKIPPER
*Under side.* ♂

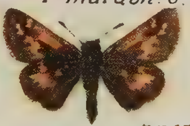

23
MARDON SKIPPER
*P mardon.* ♂.

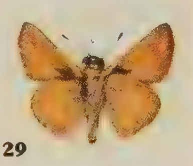

24
SANDHILL SKIPPER
*P. sabuleti.* ♂

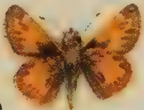

25
SANDHILL SKIPPER
*P. sabuleti* ♀.

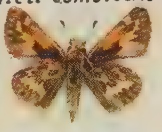

26
SANDHILL SKIPPER
*Under side.* ♂.


27
TECUMSEH SKIPPER
*P. sabuleti tecumseh* ♂


28
TECUMSEH SKIPPER
*P. sabuleti tecumseh.* ♀


29
DESERT SANDHILL SKIPPER
*P. sabuleti comstocki*


30
TECUMSEH SKIPPER
*Under side.* ♂


31
TECUMSEH SKIPPER
*Under side.* ♀

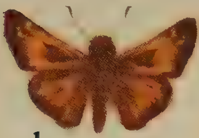
THE SKIPPERS

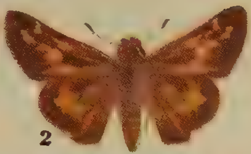
Copyright 1927, John A. Comstock

All figures slightly reduced

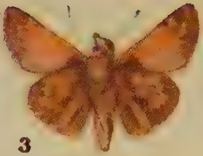
# EXPLANATION OF PLATE 62

| | | Text Page |
|---|---|---|
| Fig. 1. | *Atalopetes campestris* Bdv. ♂, Los Angeles, Cal. April 12, 1920 | 224 |
| Fig. 2. | *A. campestris* Bdv. ♀, Pasadena, Cal. August 1, 1920 | 224 |
| Fig. 3. | *A. campestris* Bdv. ♂, under side, San Jacinto Mts., Cal. June 10, 1925 | 224 |
| Fig. 4. | *Atrytone vestris* Bdv. ♂, Jemez Springs, N. Mex. June 29, 1922 | 224 |
| Fig. 5. | *Poanes taxiles* Edw. ♂, under side, Flagstaff, Ariz. July 27, 1916 | 225 |
| Fig. 6. | *P. melane* Edw. ♂, under side, Los Angeles, Cal. April 10, 1921 | 225 |
| Fig. 7. | *Urbanus tessellata occidentalis* ab. *skinneri* Gunder. ♀, Los Angeles, Cal. July 7, 1926. Type. Courtesy Jean Gunder | 208 |
| Fig. 8. | *Poanes melane* Edw. ♀, Los Angeles, Cal. April 10, 1921 | 225 |
| Fig. 9. | *P. melane* Edw. ♂, Los Angeles, Cal. April 10, 1921 | 225 |
| Fig. 10. | *P. taxiles* Edw. ♂, Flagstaff, Ariz. July 27, 1916 | 225 |
| Fig. 11. | *P. taxiles* Edw. ♀, Cochise Co., Ariz. July 23 | 225 |
| Fig. 12. | *Amblyscirtes vialis* Edw. ♂, Fitzgerald, B. C., Canada. June 3, 1921 | 225 |
| Fig. 13. | *A. vialis* Edw. ♂, under side, Fitzgerald, B. C., Can. June 5, 1921. | 225 |
| Fig. 14. | *Lerodea eufala* Edw. ♂, Indian Wells, Coachella Valley, Cal. Sept. 30, 1921 | 226 |
| Fig. 15. | *L. eufala* Edw. ♀, Indian Wells, Coachella Valley, Cal. Sept. 30, 1921 | 226 |
| Fig. 16. | *L. eufala* Edw. ♂, under side, Indian Wells, Coachella Valley, Cal. Oct. 28, 1922 | 226 |
| Fig. 17. | *Amblyscirtes phylace* Edw. ♂, Chiricahua Mts., Cochise Co., Ariz. June 26, 1908 | 226 |
| Fig. 18. | *Prenes errans* Skin. ♂, Santa Monica, Cal. August 15, 1920 | 227 |
| Fig. 19. | *P. errans* Skin. ♂, under side, Santa Monica, Cal. August 15, 1920. | 227 |
| Fig. 20. | *Calpodes ethlius* Cram. ♂, under side, Hope, Ark. Oct. 24 | 227 |
| Fig. 21. | *Prenes errans* Skin. ♀, Santa Monica, Cal. August 15, 1920 | 227 |
| Fig. 22. | *Amblyscirtes phylace* Edw. ♂, under side, Chiricahua Mts., Ariz. July 15, 1908 | 226 |
| Fig. 23. | *Megathymus stephensi* Skin. ♂, La Puerta, San Diego Co., Cal. October 10, 1922. Courtesy George Field | 228 |
| Fig. 24. | *Calpodes ethlius* Cram. ♂, Beeville, Texas. Aug. 29, 1916 | 227 |
| Fig. 25. | *Megathymus yuccæ navajo* Skin. ♂, Bellevue, Utah. June 14, '17 | 229 |

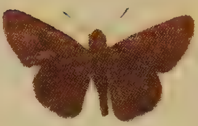

1


2

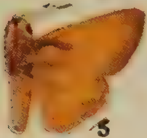
THE FIELD SKIPPER
♂. *Atalopetes campestris.* ♀


3

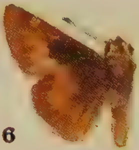
THE FIELD SKIPPER *Under side.* ♂.


4

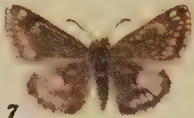
THE DUN SKIPPER
*Atrytone vestris.* ♂


5

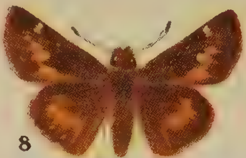
TAXILES SKIPPER
*Under side* ♂.


6

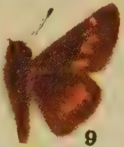
UMBER SKIPPER
*Under s* ♂


7

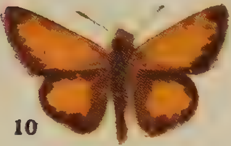
SKINNER'S ABERRANT · SKIPPER · ♀ · *Urbanus occidentalis ab. skinneri*


8

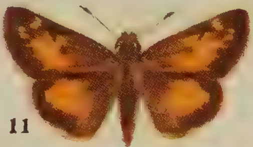
UMBER SKIPPER
*P. melane.* ♀.


9

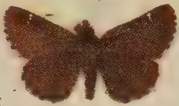
UMBER SKIPPER
*P. melane.* ♂


10

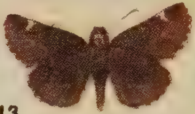
TAXILES SKIPPER
*Poanes taxiles.* ♂


11

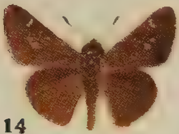
TAXILES SKIPPER
*P. taxiles.* ♀


12

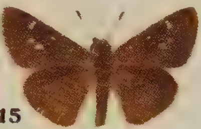
ROADSIDE SKIPPER
*Amblyscirtes vialis* ♂.


13

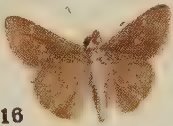
ROADSIDE SKIPPER
*Under side.* ♂


14

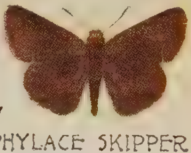
EUFALA SKIPPER
*Lerodea eufala.* ♂


15

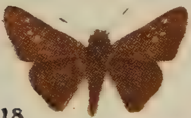
EUFALA SKIPPER
*L. eufala* ♀


16

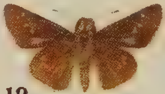
EUFALA SKIPPER
*Under side.* ♂


17

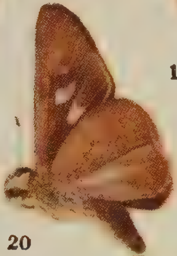
PHYLACE SKIPPER
*A. phylace.* ♂


18

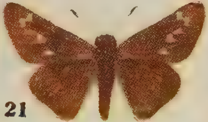
WANDERING SKIPPER
*Prenes errans* ♂


19

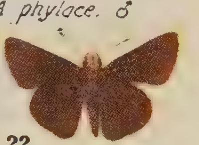
WANDERING SKIPPER
*Under side* ♂


20

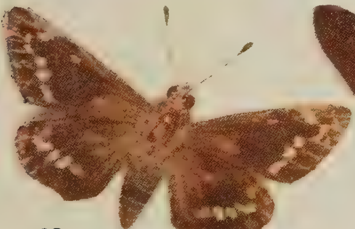
BRAZILIAN SKIPPER
*Under side.* ♂


21

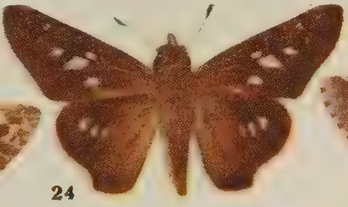
WANDERING SKIPPER
*Prenes errans.* ♀


22

PHYLACE SKIPPER
*Under side.* ♂.

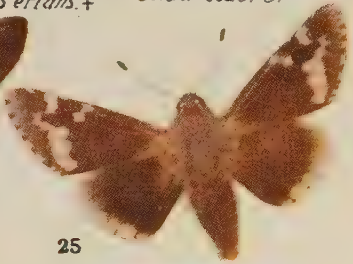

23

STEPHEN'S SKIPPER
*Megathymus stephensi* ♂.


24

BRAZILIAN SKIPPER
*Calpodes ethlius* ♂

THE SKIPPERS


25

NAVAJO SKIPPER
*M. yucca navajo.* ♂.

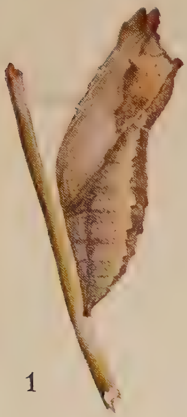
All figures slightly reduced

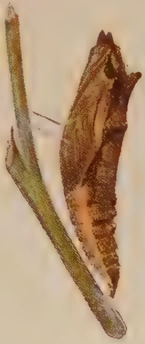
Copyright 1927, John A. Comstock

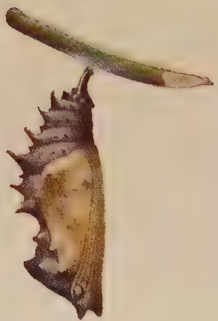
## EXPLANATION OF PLATE 63

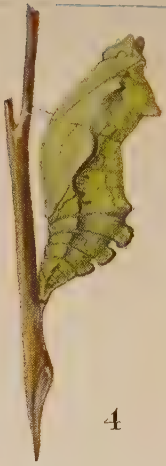
| | | Text Page |
|---|---|---|
| Fig. 1. | Pupa of *Papilio zelicaon* Luc. Slightly enlarged | 20 |
| Fig. 2. | Pupa of *Papilio rutulus* Luc. Slightly reduced | 22 |
| Fig. 3. | Pupa of *Aglais antiopa L.* | 126 |
| Fig. 4. | Pupa of *Papilio philenor* L. | 17 |
| Fig. 5. | Pupa of *Vanessa atalanta* L. | 131 |
| Fig. 6. | Pupa of *Vanessa cardui* L. | 133 |
| Fig. 7. | Pupa of *Catopsilia eubule sennæ* L. | 45 |
| Fig. 8. | Pupa of *Dione vanillæ* race *incarnata* Riley | 78 |
| Fig. 9. | Pupa of *Vanessa carye* Hbn. | 134 |
| Fig. 10. | Pupa of *Anthocharis lanceolata australis* Grin. | 40 |
| Fig. 11. | Pupa of *Eurema nicippe* Cram. | 56 |
| Fig. 12. | Pupa of *Pieris protodice* Bdv. & Lec. | 31 |
| Fig. 13. | Pupa of *Polygonia satyrus* Edw. | 121 |
| Fig. 14. | Pupa of *Glaucopsyche xerces* Bdv. | 199 |
| Fig. 15. | Larva of *Glaucopsyche xerces* Bdv. | 199 |
| Fig. 16. | Larva of *Glaucopsyche xerces polyphemus* Bdv. | 200 |
| Fig. 17. | Pupa of *Glaucopsyche xerces polyphemus* Bdv. | 200 |

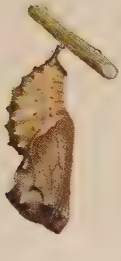
*Color drawings by R. F. Sternitzky*

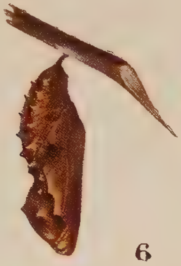

1

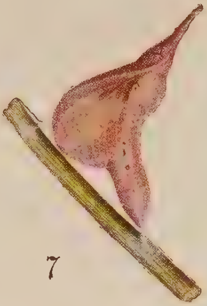

2

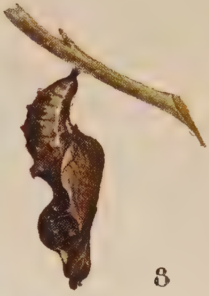

3

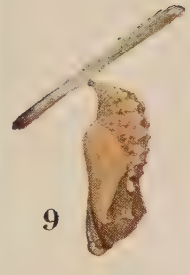

4

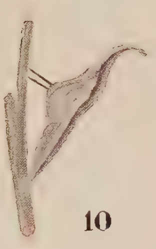

5

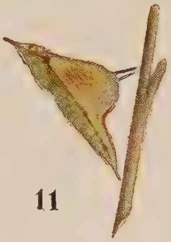

6

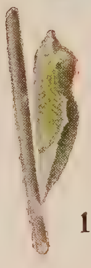

7

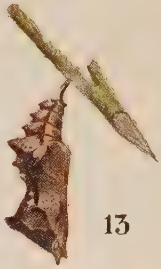

8

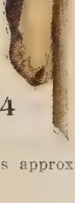

9

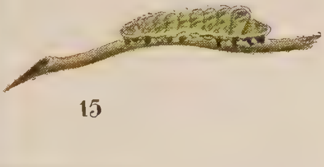

10

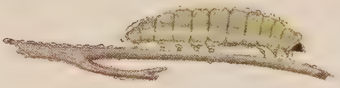

11

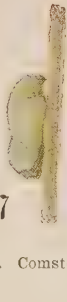

12


13


14


15


16


17

Figures approximately life size

Copyright 1927, John A. Comstock

595.78 C739
a39001 007199352b

66-1

69-1

71-1
72-1
73-1
74-1